



PAN Physicians
Association
for Nutrition

PAN International's position paper on plant-based meat products



Introduction

Plant-based dietary patterns offer the ideal strategy to simultaneously prevent non-communicable diseases (NCDs) and mitigate the effects of the current climate crisis (1-3). Plant-based diets include vitamin-rich foods such as fruit and vegetables and protein-rich ones such as legumes, pulses, nuts, and whole grains (1). It has been estimated that NCDs such as cardiovascular disease and cancer are responsible for 71% of all premature deaths globally (4). Low consumption of fruit, whole grains, nuts and seeds and vegetables has been identified as the leading dietary risk factor for premature deaths related to NCDs (5). Therefore, increasing the consumption of these foods is a valuable strategy to improve the population's health.

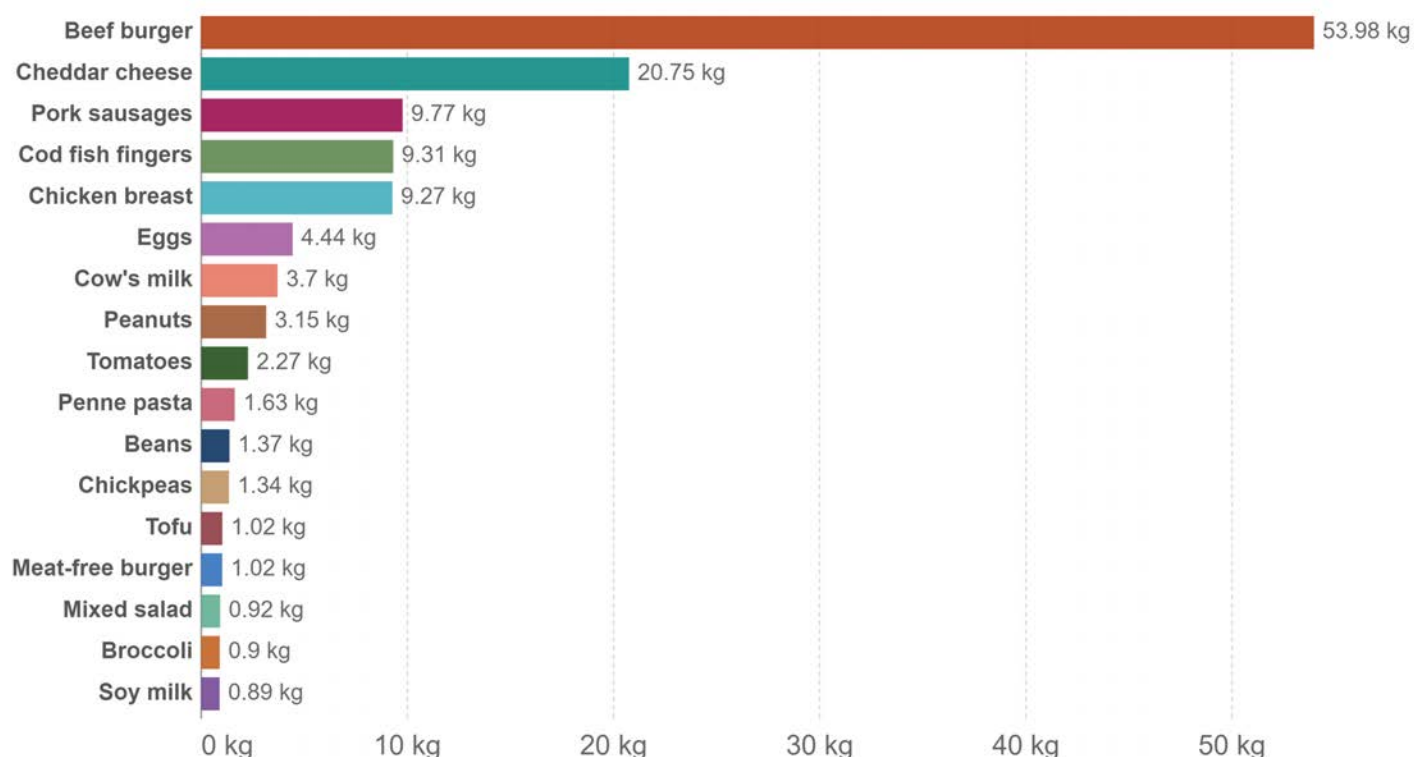
Further, consuming more plant-based foods is a significant strategy in addressing climate change. A large body of evidence shows that, compared to meat and other animal-based products, the production of plant-based foods requires less fresh water and land, emits fewer greenhouse gases and has a reduced impact on biodiversity and the natural environment (3, 5,6). For example, the production of 1 kg of beef

burgers emits more than 50 times more greenhouse gases than 1 kg of plant-based foods rich in protein such as tofu, beans or peanuts (Figure 1). The greenhouse gas emissions released by the production of fruit, vegetables and grains are also extremely low when compared to animal-based foods. The situation is similar for other indicators of environmental degradation such as land and water use, eutrophication, and biodiversity loss (3).

Encouraging people to choose more plant-based foods and changing food environments so that more healthy plant-based foods become accessible are key actions to effectively improve population health, address climate change, reduce water stress and pollution, restore forests and protect the world's wildlife. Tackling climate change is particularly important for low and middle-income countries as these are more vulnerable to extreme weather events such as droughts and floods, have fewer resources to invest in adaptation measures, and are heavily dependent on agriculture for their livelihoods (6).

Figure 1: Greenhouse gas emissions per kilogram of food

Emissions are measured in carbon dioxide equivalents (CO₂eq). This means non-CO₂ gases are weighted by the amount of warming they cause over a 100-year timescale.



Source: Michael Clark et al (2022). Estimating the environmental impacts of 57,000 food products. PNAS. OurWorldInData.org/environmental-impacts-of-food • CC BY

Shifting to plant-based diets has been proposed as one of the key solutions to mitigating the effects of the climate crisis. However, people face many barriers when adopting a more plant-based dietary pattern (7). Shopping, preparing and cooking meals based on vegetables, legumes and whole grains requires skills and time which are not available to everyone (8). Additionally, many people trying to reduce their meat intake reported missing the texture, taste, and convenience of meat products such as sausages and burgers (9,10). To overcome these problems, manufacturers created plant-based meat (PBM) products which mimic the taste and texture of meat products and require very little preparation (10,11). The composition of plant-based meat products varies greatly. The primary ingredients of these products can be vegetables, whole pulses, or fungal proteins such as mycoprotein. However, the great majority of these products are based on soya and pea protein isolates and wheat. Different studies showed that compared to meat, PBM products require less water and land, and emit fewer pollutants and greenhouse gases for their production and therefore are a more environmentally sustainable food choice than meat (12,13).

Plant-based meat products might be an important solution to improve national food security not only in high-income nations but also in low and middle-income countries (14). Livestock production requires enormous quantities of grains and other crops used as animal feed that could be fed to people. The high demand for these crops pushes prices up making these staple crops unaffordable for those in low and middle-income nations thus contributing to hunger. Plant-based protein might also offer a more stable supply of protein as the meat supply chain is very fragile and vulnerable to shock. Plant-based alternatives could be easily produced at a national level (with only a fraction of the resources needed to produce meat) making countries independent in their protein supply. This is particularly relevant in low and middle-income nations where the population is projected to grow exponentially and will soon shift to high-meat diets (15).

Is plant-based meat a healthy option?

Although these products have been around for a while, it is only in recent years that the availability and consumption of these products have increased considerably. This has led consumers to know more

about the overall healthiness of these products, and in particular, how these products compare with conventional meat products.

Studies considering the health impacts of PBM

Since consumption of PBM has increased only recently, there is limited evidence showing the long-term health impacts linked to PBM intake. Observational studies on vegetarians showed that plant-based diets are linked to a reduced risk of ischaemic heart disease and cancer (16,17). However, due to the way in which studies have been designed, it is impossible to single out the health effects of PBM products (such as soya burgers). Moreover, people who follow a plant-based diet are likelier to have other health-promoting behaviours (e.g. they do not smoke or drink alcohol). These factors make the interpretation of these studies problematic.

Intervention studies considering the health impacts of PBM

There is a very limited number of intervention studies, such as randomised controlled trials, which have evaluated the impacts of PBM products on human health indicators such as body weight or cardiometabolic markers such as blood lipids (18,19). Compared to animal meat, PBM seems to reduce body weight and reduce total cholesterol (19). However, there is not enough data supporting the hypothesis that in the long term, PBM might improve biomarkers of human health and reduce disease risk.

Studies considering nutrient PBM's nutrient content and nutrient quality

A quicker and cheaper way of assessing the overall healthiness of manufactured food products such as PBM is to look at their nutrient content and overall nutrient quality. The nutrient quality of foods can be determined through nutrient profiling tools. These are algorithms that consider the balance of "positive" nutrients and components (such as dietary fibre, protein and fruit and vegetables) and "negative" nutrients (such as saturated fat, salt, and free sugars) which are relevant for the prevention of obesity and NCDs.

Recently, a good number of studies showed that compared to their meat equivalents, PBM products have, on average, a better nutrient profile as they have

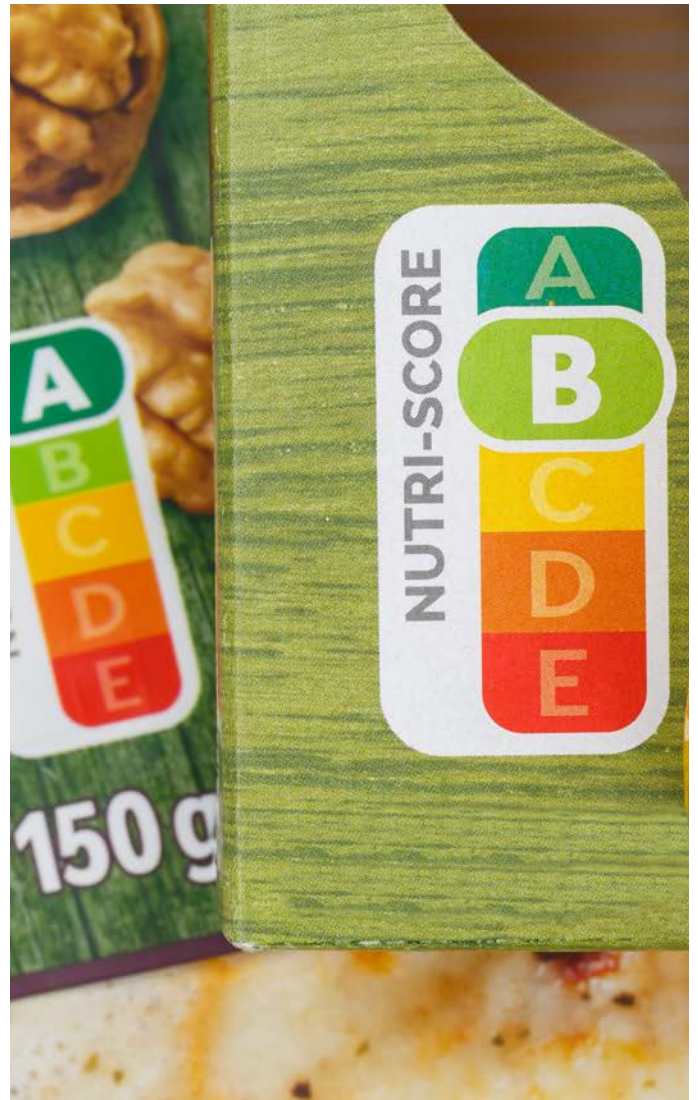
fewer saturated fat and calories and more fibre per 100 grams than the corresponding meat products (20,21). Other studies reported that in some countries, these products are high in salt (20,22). In contrast, studies carried out in other countries reported that, on average, these products contain less salt than their meat counterparts (21,23). PBM tends to have similar amounts of dietary protein as meat, but this depends on the primary ingredients used to manufacture PBM products (21,23,24). For example, PBM made from vegetables or mushrooms are very likely to contain considerably less protein than PBM made from soya, wheat, or beans.

How to choose a healthier meat alternative?

All the studies assessing PBM's nutrient content showed a wide variation of nutrient content within the same product category. For example, often on the same supermarket shelf, it is possible to find soya-based sausages with very low salt content and a similar product with very high salt content from another brand. Since research showed that in some contexts salt was high in PBM, choosing the product with the least salt would be the healthier option. Products based on dried isolated soya protein, such as soya chunks, are probably one of the healthiest plant-based meat products as they don't contain any fat and salt. However, these products are not as convenient as ready-made plant-based burgers, because they require some time and basic cooking skills for their preparation.



In some countries, it is possible to find Front-of-Pack (FoP) nutrition labelling displayed on product packaging. FoP labels refer to a nutrient profiling tool and help consumers to make decisions at a glance. Nutriscore is the most common FoP labelling system in Europe. According to NutriScore, products with a green “A” label are considered healthier, while products with a red “E” label are considered less healthy as they are high in fat, sugar, and salt (25).



Are these products ultra-processed?

The NOVA classification of food is a system for categorising foods based on the degree of processing they undergo (26). According to the NOVA classification, foods can be categorised into four groups.

- Unprocessed or minimally processed foods, such as fruits, vegetables, nuts, and grains.
- Processed culinary ingredients, such as salt, sugar, oils, and fats.
- Processed foods, such as canned fruits and vegetables, bread, cured meats, and cheese.



- Ultra-processed foods are defined as “formulations of ingredients of exclusive industrial use” that include “ingredients never or rarely used in domestic kitchens” which include most packaged snacks, sugary drinks, and ready-to-eat meals.

The NOVA classification is widely used in nutrition research to investigate the health effects of different types of diets and dietary patterns. It has been found that diets high in ultra-processed foods are associated with a higher risk of obesity, type 2 diabetes, and cardiovascular disease, while diets based on unprocessed or minimally processed foods are associated with lower risks of these chronic diseases (27-29). Most plant-based meat products classify as ultra-processed food (21-23). However, specific evidence on the long-term impacts of PBM as UFP and disease risk is missing. In studies using the NOVA classification, PBM is often grouped with notoriously unhealthy products such as chocolate snacks, fast foods and sugary drinks, which are high in calories, fat, sugar, and salt. It is therefore difficult to make solid conclusions about the healthiness of PBM products based on the NOVA classification (30).

It is also worth mentioning that according to the NOVA classification, meat sausages, burgers and nuggets are also classified as ultra-processed food. Thus (according to NOVA) both plant-based meat and meat products would be grouped together and have similar implications on health. However, a large body of evidence shows that the consumption of ultra-processed meat products is linked to adverse health outcomes (see paragraph below).

If I eat a PBM sausage instead of a pork sausage, will I reduce my disease risk?

The World Health Organization recognises that

consuming (ultra-)processed meat increases colorectal cancer risk, and that red meat probably increases colorectal cancer risk (31). Overconsumption of red and processed meat is also associated with an increased risk of heart disease, some other types of cancer, type 2 diabetes, and premature death (16,32,33). Thus, avoiding or reducing red and processed meat intake and eating more plant-based proteins such as legumes can reduce the risk of colorectal cancer. However, there isn't enough evidence showing that eating a plant-based burger instead of a beef burger might reduce the risk of colorectal cancer and the other conditions above.

Are these products lacking important micronutrients available in meat?

PBM products, like all plant-based foods, are not a sufficient dietary source of vitamin B12 (34). Meat and animal-based products are the most important dietary source of vitamin B12, and supplementation is recommended for those following a vegan diet (35,36). Plant-based foods and PBM also contain a less bioavailable form of zinc, an important micronutrient highly available in meat (37,38). On the other hand, recent evidence suggests that the levels and bioavailability of iron in soya-based PBM and meat might be similar (38). More in vivo studies are needed in this area to understand how PBM can be improved to be an effective source of key micronutrients.

Surveys conducted in different countries show that only a small fraction of PBM are fortified with B12, zinc, and iron (21,23,24). A recent investigation showed that only 12% of PBM available in Australia was fortified with iron and vitamin B12 (21). Fortified products might fulfil the micronutrient needs of the entire population. Therefore it might be sensible to choose fortified products whenever possible.

How often should these products be consumed?

While countries worldwide are increasingly recommending plant-based protein options such as pulses, nuts, tofu and tempeh instead of meat, there are no official recommendations regarding if and how often PBM such as plant-based sausages, burgers, and nuggets should be eaten (39). In the absence of specific guidelines, it is best to choose products that are low in calories, fats, and salt and that have been fortified.

Are they safe for children?

There is no evidence suggesting that PBM is unsafe for children already consuming a solid diet. However, since most of these products are based on soya and wheat, two common food allergens in children, parents and those caring for children should check PBM's ingredient list. PBM can also contain nuts, eggs, lupin, broad beans, and pea protein which can cause reactions in some individuals.

Plant-based meat products contain additives. Should one avoid these substances?

According to the World Health Organization (WHO), additives are "substances that are added to food to maintain or improve the safety, freshness, taste, texture, or appearance of food...and are added intentionally to food to perform certain technological purposes which consumers often take for granted" (40). Only additives approved by the Joint FAO/WHO Expert Committee on Food Additives (JECFA) and found not to put consumers' health at risk can be used. National authorities, either based on the JECFA assessment or a national assessment, can then authorise the use of food additives at specified levels for specific foods. Like many other manufactured food products, plant-based meat also contains food additives. However, plant-based meat producers can only use additives that national authorities have deemed safe for consumption.

What is PAN's position on plant-based meat products?

- PAN promotes a whole-food, plant-based diet as this is the best approach to prevent NCDs and mitigate the impacts of the current climate crisis.
- PAN endorses the consumption of legumes, pulses, nuts, seeds, tofu, tempeh, and whole grains, as these are the healthiest and more environmentally sustainable protein options.
- PAN acknowledges the potential of PBM products as a healthy, sustainable and convenient alternative to meat, particularly when people want to transition to plant-based diets and lack the time and cooking skills needed to make meals based on unprocessed plant-based protein such as legumes.
- PAN recommends choosing PBM products low in unhealthy nutrients such as saturated fat and salt and fortified with crucial micro-nutrients for plant-based diets such as vitamin B12, iron and zinc.
- PAN recognises that PBM manufacturers have a crucial role in making available food options that are both healthy, sustainable and convenient.
- PAN, together with other health organisations, supports PBM manufacturers as well as the alternative protein industry in their efforts to produce healthier options (i.e. reformulation and fortification).
- PAN strongly encourages the research and development of the whole alternative protein sector. The latter will play a pivotal role in improving the environmental sustainability of the food system and improving the health of the population.
- Finally, PAN recognises the importance of generating new and high-quality scientific evidence considering the long-term health impacts of alternative proteins.

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