



PFNDAI

# FOOD, NUTRITION & SAFETY MAGAZINE

BULLETIN MAR 2024

## THE **IMPACT** OF **PLANT-BASED** **DIETS** ON **HEALTH** AND THE **ENVIRONMENT**

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ONLY MINIMUM  
EFFECTIVE STANDARDS**

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# USE OF ARTIFICIAL INTELLIGENCE (AI) IN FOOD SCIENCE & NUTRITION

We have seen AI being used in many fields for various applications. We used to hear about its applications by others and wonder how far it would affect lives. Some videos showed how using AI people can create fake images and videos by superimposing one face onto a celebrity so people would see an ordinary person singing popular songs, or play sports like a professional or do so many things.

People have also created fake stories in such genuine-looking manner that it is now difficult to believe any amazing story, wondering whether it was faked using AI. It seems we all are not too far from being able to use AI. There are now apps available that can help you write an article or prepare points or change language. So we can also write like experts. We may even get some help in getting some innovative products or even some solutions to difficult problems in our professional lives.

But that is not a worrying part.

There are news reports of ChatGPT being used for getting expert advice for common people. Nutrition related advice is apparently available on ChatGPT so one does not have to go to health professional. Just ask for a solution to the health problem you have and you will get a solution. So, a layperson may be able to get free and instant advice and may do self-treatment.

Experts are already alarmed at this development and feel that sometimes

inaccurate advice would be given since the AI screens all the published literature, not all of it would be accurate as we know that not everything that is in public domain is credible. There are many people, expert or not giving advice or solutions in various media. Not all of it is validated properly.

The second problem would be whether the person seeking the advice would be able to properly implement the treatment if he or she is not trained in that. Expert health professionals also know when to stop or change the course of treatment because of side-effects. This may not be possible when a layperson is self-treating.

Thus, we may see some problems in future when "science gathers knowledge faster than society gathers wisdom", as stated by Isaac Asimov. However, we cannot stop the advance of AI which will affect everyone.

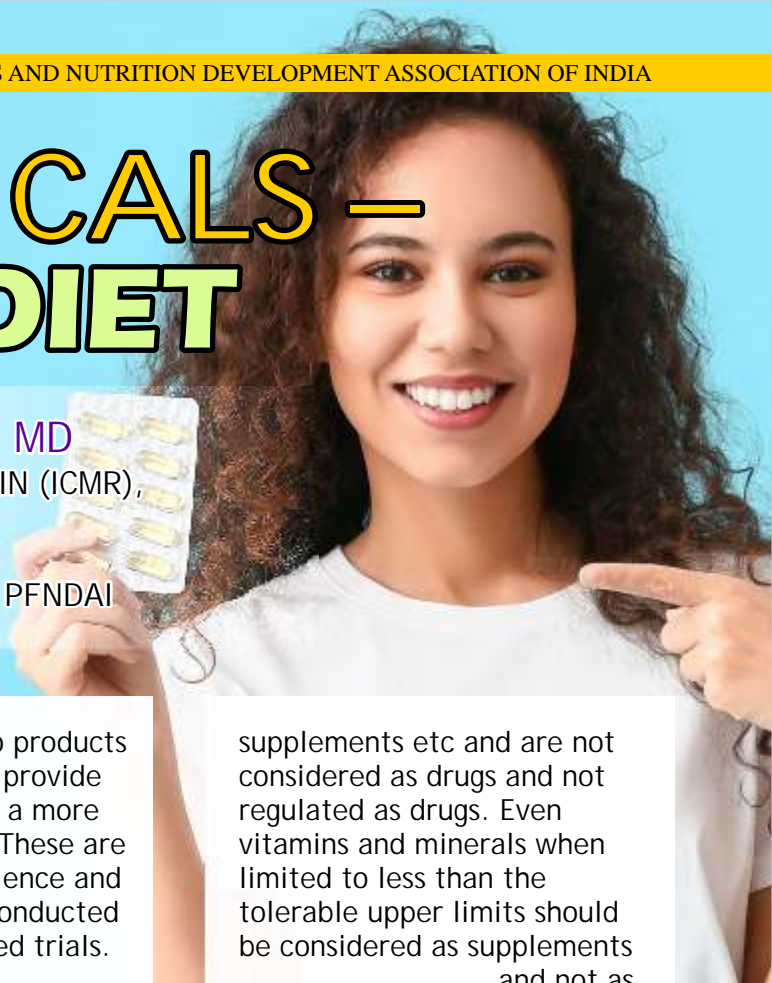
Students may find AI teaching them food science and nutrition and many other subjects and may stop attending classes. Bankers may find that AI can do the jobs of clerks and accountants more accurately and faster. Workers may find AI can operate robots and drones for work they were doing. We hope that in our pursuit of science and making our lives easier, we do not let the AI make humans redundant.

**Prof Jagadish Pai,**  
Editor, PFNDAI

# VITAMIN D KI TAAKAT



# NUTRACEUTICALS – PART OF OUR DIET



By **Dr Sesikeran. B, MD**  
 M.D., former Director, NIN (ICMR),  
 Chairman- Scientific  
 Advisory Committee &  
 Hon. Scientific Director, PFNDAI

Sailors in the 18th and 19th century died of a bleeding disorder called Scurvy, until it was discovered that Lemons could treat the problem. Later the ingredient vitamin C was identified. By present day regulation “lemon” is a drug, since it could treat a disease. Similarly a carrot can be used to treat vitamin A deficiency diseases like night blindness.

Food can be a medicine and yet not a drug. With advancement of science there are several categories of food and components of food with health benefits. These include functional foods, nutraceuticals, pharmaceuticals, biologically active molecules, herbal ingredients and so on. While we encourage consumers to obtain nutrients and bioactive substances through whole foods, sometimes it may not be

practical. This led to products in the market which provide the same benefits in a more convenient manner. These are all based on good science and some even on well conducted randomised controlled trials.



Probiotics for example were discovered from traditional fermented foods but not all fermented foods contain probiotics. Beta carotene, lycopene, zeaxanthin are all sourced from vegetables but collectively are beneficial for eye health.

Most major regulatory regimes across the world categorise them as nutraceuticals, food

supplements etc and are not considered as drugs and not regulated as drugs. Even vitamins and minerals when limited to less than the tolerable upper limits should be considered as supplements

and not as drugs. This regulatory difference from drugs makes them accessible to all without need for a medical advice. These are usually for general

well-being and to overcome physiological variations in our bodies rather than for anything pathological. Users must be aware that if they do have a health issue they need to seek medical advice and use the well-regulated category of drugs. Consumers also need less expensive easily available and safe alternatives to prescription medication.



Regulation in Australia have nutraceuticals under a category called "Therapeutic Goods." These include medicines, biologics and devices. Herbs, minerals, vitamins and nutritional supplements come under "complementary medicine". Low risk among them are listed under the Australian register of therapeutic goods but are not regulated.



High risk medicines are registered and regulated. This is comparable to FSSAI regulation on nutraceuticals and the CDSCO regulation on drugs.

Canada calls them natural health products or NHPs and do not require a prescription but should have established safety. About 43,000 products come under this regulation, however Pre-market approval is needed.

Japan categorises nutraceuticals under three categories

1. Food with nutrient function claims (FNC) mostly vitamins and minerals
2. Foods for special health uses (FOSHU) for other functions and

3. Food with functional claims (FFC).

Japan was the first country to regulate food supplements. Even if there is no validated health claim if the ingredient meets the safety requirements of FOSHU, it can be approved. Substances designated as medicines are regulated under the pharmaceutical affairs act. Similar to our drugs and cosmetic act. Herbals are under the category of medicines instead of functional food and on par with prescription drugs.

In USA nutraceuticals are termed as dietary supplements. They are defined under the DSHEA regulation as



a product intended to supplement the diet that contains one or more of the following dietary ingredients vitamin, mineral, a herb or other botanical and amino acid or a dietary substance for use by man to supplement the diet by increasing the total daily intake or a concentrate, metabolite or constituent extract or a combination To conclude, our regulation in India under the FSSAI is fairly comprehensive and robust and in line with the global nutraceutical regulations

Reference:

Jessica blaze. A comparison of current regulatory framework of nutraceuticals in Australia, Canada, Japan and the United States(2021) INNOV. PHARM. 12( 2).



# WHEN DOES A NAME MISLEAD?



**AUTHOR**  
**Dr Joseph I Lewis,**  
Chairman, Regulatory Affairs,  
PFNDAI

In older days, coconut milk and guava cheese were prepared, sold and consumed without a fuss. Words such as milk and cream were used as metaphors to describe consistency. If the description was unclear to consumers, the name would not have lasted. Every product purchased in the past several decades demonstrates consumers are not misled. Naming foods has now become contentious. The question is whose understanding is unclear or who is misled.

Grammatically speaking there is some basis for using such words. A common noun names something non-specific. Opposite of a common noun is a proper noun, which names a specific person, place, or thing and is usually capitalized. Food is said to be a concrete noun - a sub-set of common nouns -used when one can experience such sensory attributes as sight, smell, taste, and touch. Milk, cream, sauce, pickle, and chutney are concrete nouns. Of course, consumers have no time to check correct grammar. Consumers are quite savvy in the marketplace where food names are tested and where

sense and sensibility prevail over all else.

Often words stimulate visual descriptions. A soup called "sweet corn cream style" obtains its consistency from the soupy liquid residue of immature pulped corn kernels. For consumers, the use of the word "cream" stimulates the expectation of a certain consistency. Use of the word becomes clear, if there is an understanding of its manufacturing process. Optionally the same consistency could have been obtained using dairy milk. For example, cream of tomato soup may use dairy milk after adjusting the pH. However, the absence of milk in the ingredient list should not be construed as misleading or misbranding. Researching the provenance of a name ought to be done before a stand is taken. A "made in India" product 'Cream Cracker Biscuits' previously an English import is another case. Introduced in the market after many years, the word "cream" refers to the method of creaming the mixture during manufacture. The name was hurriedly modified perhaps from likely disagreements.

Better free from worry is another way of compliance.

Typically, FAQs issued by the regulator should provide the reasoning that will be used to determine wrongdoing. If there is wrongdoing, an improvement notice should provide reasoning based on facts. Labelling provides conditions for using words, pictures, graphics and even emphasis. Emphasis is highlighting an ingredient. Would using the words milk in coconut milk or cheese in guava cheese be considered "highlighting" when used to describe consistency? Are they expecting milk to be declared in the ingredient list? A consumer buying a 50g package of chicken tikka masala does not expect to find a chicken even with such a picture on the label. Language is an expression, not a prescription.

Expressions as analogues, alternatives, substitutes or imitations, are used either as a statement of fact, without bias or with hints of inferiority. The latter often exposes positions and interests rather than facts of the matter. Analog watches have given way to digital: no one calls the latter imitations or "analogues". Both simply tell the time. Now watches even take written messages and post them. So, who is being misled if you call a watch a watch?

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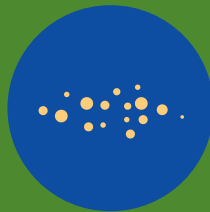
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# THE IMPACT OF PLANT-BASED DIETS ON HEALTH AND THE ENVIRONMENT



**AUTHOR**

Ms Fatema Noorani,  
Nutrition, Marico Limited

infection.

WHO (2023) states that Non-Communicable Diseases (NCDs) lead to about 41 million deaths (74% of total deaths) every year and most of the deaths are earlier than 70y. Globally, cardio-vascular diseases (CVDs) (including heart attacks and strokes) account for maximum deaths by NCDs (17.9 million)

followed by cancer (9.3 million), chronic respiratory diseases (chronic obstructive pulmonary diseases and asthma) (4.1 million) and diabetes (2 million including deaths by kidney diseases). Additionally, ICMR evaluated the population in the study "India: Health of the Nation's States" estimating the proportion of deaths due to NCDs has steeped from 37.9% in 1990 to 61.8% in 2016 (Kumar et al, 2020).

In India, the rates of diabetes, hypertension and

dyslipidaemia have increased several folds with evident regional variations. For example, in Maharashtra >30% and >10% of the population is suffering from hypertension and diabetes respectively.

The triple burden of malnutrition calls for a cause for caution highlighting the impact of overnutrition and micronutrient deficiency on overall health.

India is currently the most populated country of the world, and the health status of Indians has a crucial impact on the health of the planet. There is a transition observed with an exponential rise in non-communicable diseases as opposed to diseases due to undernutrition and

**PERCENTAGE DEATH FROM NCDS**

■ Cardiovascular diseases ■ Diabetes ■ Chronic Respiratory Issues ■ Cancer

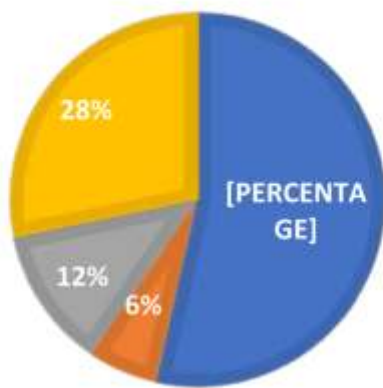


Fig 1: Classification of Non-Communicable Diseases

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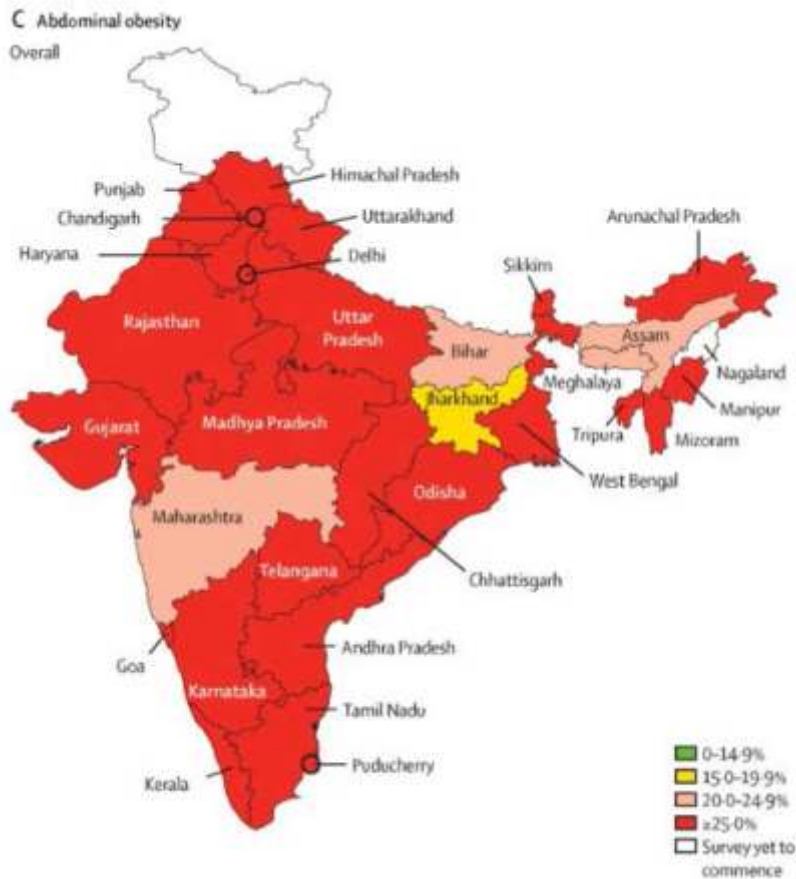


Fig 2: Percentage of Abdominal Obesity In India (Anjana et al. 2023)

A contributing factor to this ever-increasing rise could be attributed to abdominal obesity. Various regions of India have shown 20-25% of the population with abdominal obesity. Abdominal obesity also termed as visceral fat/abdominal fat can cause metabolic imbalance and release pro-inflammatory cytokines. (Anjana et al, 2023)

### Modifiable and Non-modifiable Risk Factors of NCDs

According to the Centres for Disease Control and Prevention (CDC), a risk factor is defined as an aspect of personal behaviour or lifestyle, an environmental determinant or hereditary characteristics that are associated with an increase in the occurrence of a

health condition (Nethan et al, 2017). Of the modifiable risk factors, diet plays a major role in impacting NCDs. In 2017, it was reported that 11 million deaths due to NCDs were attributable to dietary factors with a diet high in sodium and low in whole grains and fruits being the major contributable factors (Afshin et al, 2019). It has been estimated that suboptimal intake majorly insufficient wholegrains, excess refined grains and processed meats attributed to 14.1 million incident T2D cases, representing 70.3% of new cases globally (O'hearn et al, 2023).

To navigate this, health authorities have proposed guidelines to address the effects of cardiovascular

diseases and diabetes. The American Heart Association (AHA), recommends adjusting a balance between energy expenditure and intake, consume plenty of fruits, vegetables, wholegrains, choose healthy sources of protein - mostly from plant sources, consume seafood, low-fat dairy, plant oils (Lichtenstein et al, 2021). Similarly, American Diabetes Association (ADA), recommends emphasis on key nutrition principles through consuming non-starchy vegetables, whole fruits, legumes, wholegrains, nuts, oilseeds and low-fat dairy products. AHA notes that a few diets align with their guidelines, and this includes Dietary Approaches to Stop Hypertension, Mediterranean Style, Pescatarian, Ovo-Lacto vegetarian, Vegan, Low fat. Although all these diets have evidenced health benefits, the plant-based diets are beneficial for both, health, and the environment.

### Plant-Based Diet - A revolution

Plant based diets or plant forward eating constitute a diverse range of dietary patterns that emphasize foods derived from plant sources coupled with lower consumption or exclusion of animal products. Vegetarian diets form a subset of plant-based diets, which may mean partial or complete exclusion of animal foods (Mcmanus, 2021).





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Consumers are choosing plant-based diets mainly for the beneficial effects with animal welfare, environmental impact and personal health improvements (PBFIA, 2022). According to a 2019 UN report, balanced diets that include plant-based foods can help address the climate crisis. Plant based meats emits 30-90% lower greenhouse gas and 51-91% lesser aquatic nutrient pollution. It also takes up 47% lesser land, as opposed to industrialized animal agriculture emitting 14.5% of greenhouse gas.

Switching to a plant-based diet

can reduce an individual's annual carbon footprint by up to 2.1 tons with a vegan diet or up to 1.5 tons for vegetarians. While complete adoption overnight is difficult, easing into a plant-based diet by eating more vegetables for a particular meal.

A study carried out in 136 subjects for 12 weeks to understand the effect of replacing animal-based food sources with plant-based food sources observed a reduction in protein intake, increased fiber, improved dietary fat composition, and lead to a more favourable lipid profile. When following a plant-based diet, it is important to be mindful of the protein intake (Päivärinta et al, 2022).

According to the What India Eats study, 2020, in both, urban and rural India the consumption pattern to obtain protein, is from cereals and millets followed by milk and milk products. There is a poor consumption of pulses, legumes and oilseeds. Diversifying protein consumption from sources including cereals, millets,

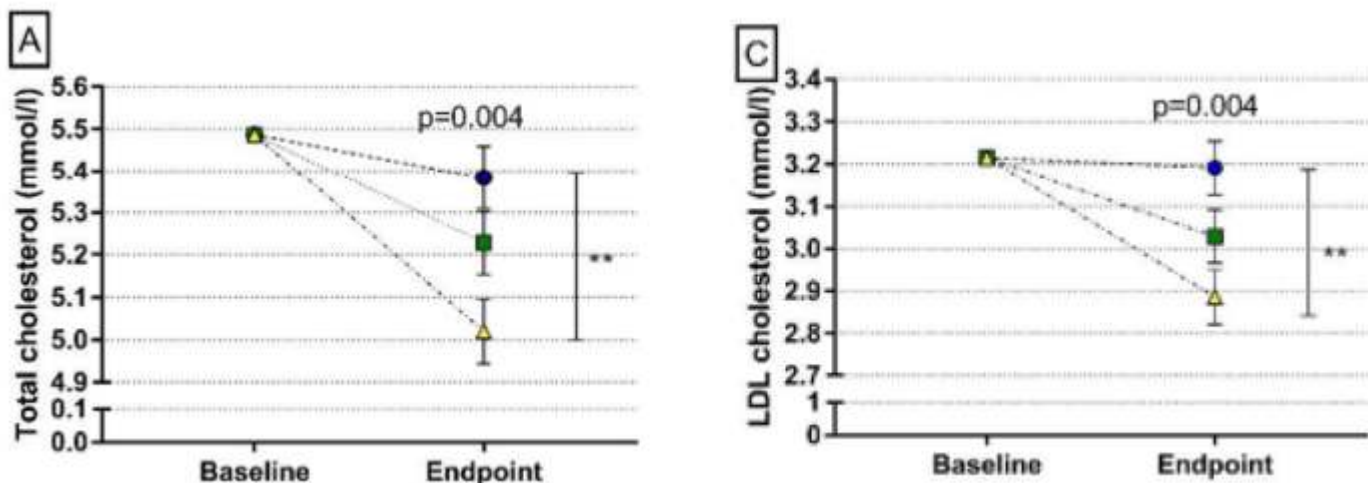
pulses, legumes, nuts and oilseeds will help in meeting the protein recommendations of 0.8-1g/kg/body weight.

### Protein and weight management

The beneficial role of protein in weight management has been established for some time. A European multicentre study in 938 subjects reported that on consuming higher protein and lower glycaemic index (GI) diets, lesser weight regain was noted.

The mechanism of action may be protein's ability to control appetite by stimulating satiety hormones & BCAA help provide energy, It also has a thermogenic effect in the body by increasing energy expenditure and BMR, adequate protein consumption improves body distribution with greater fat reduction and lower muscle loss, and it reduces neural activation in the brain responsible for food motivation. Consuming protein for breakfast has shown to reduce food cravings when compared to carbohydrate breakfast (Noakes, 2018).

Fig 3: Effect of plant vs animal food on total and LDL cholesterol, Päivärinta et al, 2022





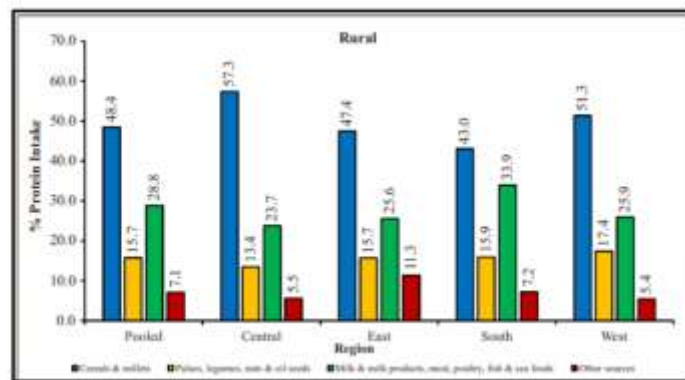
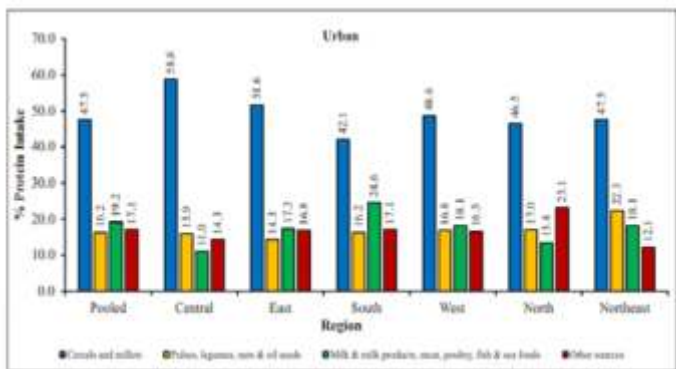


Fig 4 : Consumption of % Protein intake from different food groups, What India Eats, 2020

**Plant protein and NCDs**

According to WHO, 2023, 1 in 5 deaths due to NCDs in adults is associated with unhealthy diets. A higher plant protein intake and replacement of animal protein is associated with lower risk of all-cause and cardiovascular mortality. Replacing animal with plant proteins leads to small improvements in A1C and fasting glucose in individuals with type 2 diabetes. Plant proteins are lower in saturated fat and support planetary health. (O’hearn et al, 2023).

A systemic review and meta-analysis of 37 studies, indicated that a shift from animal-based (e.g., red and processed meat, eggs, dairy, poultry, butter) to plant-based (e.g., nuts, legumes, whole grains, olive oil) foods is beneficially associated with cardiometabolic health and all-cause mortality. (Neuenschwander et al, 2023).

Similarly, in a randomized control trial in 22 twins consuming either vegan or omnivorous diets for 8 weeks showed to improve overall diet quality. A vegan diet experienced significant mean (SD) decrease in LDL- C,

fasting insulin level and body weight and offers a significant protective cardiometabolic advantage (Landry et al, 2023).

A plant-based diet has also shown to reduce BMI and in turn help with lowering the risk of diabetes (WHO, 2023). A randomized single-blind controlled dietary intervention with nutritional counselling was carried out to understand the consumption of a plant-

based diet on the phenomenon of diabetes remission in 177 subjects for 5 years. Diabetes remission can be defined as, “as HbA1c < 6.5%, fasting plasma glucose < 126 mg/dL and 2 h plasma glucose < 200 mg/dL and maintaining these levels for at least 2 consecutive years without the use of diabetes medication to lower blood glucose levels” and was evaluated through the Kaplan-Meier method.

Fig 5 : Absorption rate of protein from different sources for muscle protein synthesis.

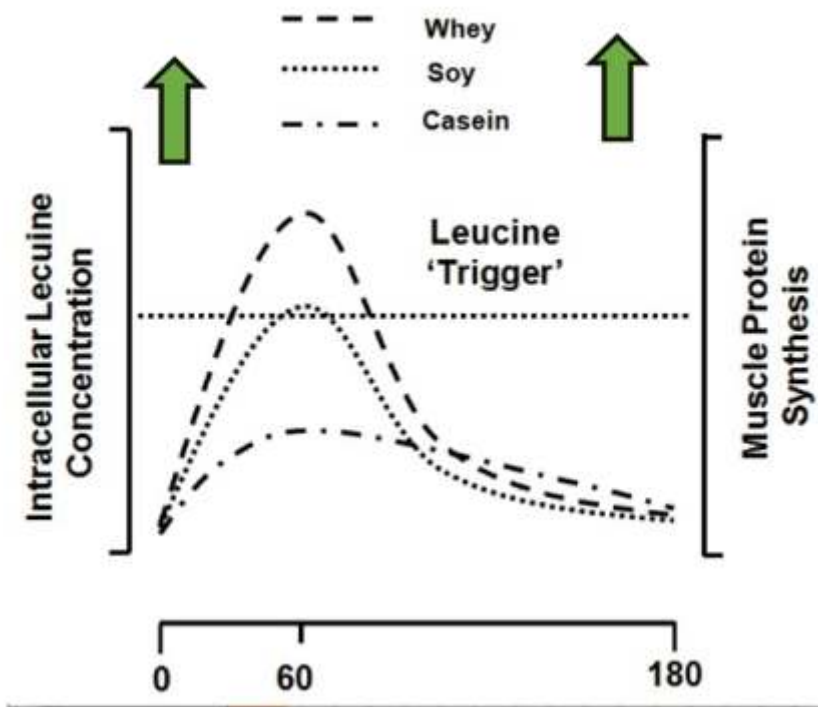




Fig 6: 8 ways to start a plant-based journey, Mcmanus et al, 2021

The diet resulted in lower intake of animal protein, cholesterol, saturated fatty acids, and fat, and with higher intake of whole grains, fibre, carbohydrates, legumes, and tree nuts. Additionally, there was a change in weight loss, glycaemic control and HbA1c and was negatively associated with T2 diabetes development (Gutierrez-Mariscal et al, 2023).

### Plant Protein and Muscle Protein Synthesis

A major role of protein in the diet is muscle building. Animal sources of protein are high biological value proteins and have been reported to be better for muscle protein synthesis post exercise. Muscle Protein Synthesis (MPS) is the driving force behind adaptive responses to exercise. Leucine plays a key role in triggering the MPS m-TOR pathway. A per meal amount of 700-3000 mg is sufficient for MPS

stimulation and to retain muscles. Plant protein sources can also help in achieving adequate protein for MPS. To achieve 2.7g of leucine - 25 g whey protein/20 g corn/33 g potato/ 37 g brown rice/38 g pea/40 g soy/45 g wheat/47 g oat can be consumed. A combination of whey, soy and casein may be helpful to achieve prolong muscle protein synthesis.

### A compliant way to start a plant-based journey could be by adapting to a few simple steps.

In conclusion, depending on one's health condition and need of the hour, adopting a partial or complete plant-based diet can be beneficial for health and the environment.

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# A POLICY TO ENSURE ONLY MINIMUM EFFECTIVE STANDARDS

Once foods are standardised, businesses and regulators disengage from improving them. Unattended, they remain only to pose barriers to innovations and increase the compliance burden. When there is no legislative mechanism for periodic review, ineffective ones are retained along with new standards added on. Without a policy for planned obsolescence, no one actively pursues replacement, revision or removal. The system becomes accumulative. This is an indication of a sector in stagnation, where neither enterprise nor innovation can flourish.

If an enterprising FBO sought amendments to add nutrients an outright dismissal is more likely than a fair evaluation of why not. If he did so without permission he would be prosecuted. For over 90 years, identity standards have been a regulator's main food control mechanism. Without a sunset clause, the inventory of underperforming standards will keep on increasing.

AUTHOR  
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 PFNDAI



Standards of identity were required as foods were no longer consumed locally and quickly but reached distant markets. Originating from homemade recipes, the name assigned identified them and the accompanying standard ensured their sensory attributes during transit. Most of the specifications were to control spoilage, later comprehensively expressed as best before dates.

For example, a minimum total soluble solids of 68% (sugar content), for jam (PFA1954) is required which was a traditional way to preserve fruit. Anything less than that would be adulteration. While the US FDA, under the Pure Foods Act (1906), successfully prosecuted offenders for adding water to milk, it faced a challenge with "Bread Spread", a product containing 20% fruit instead of the 45% required in jam. The courts held that it was not adulterated jam, but a

truthfully labelled product that contained less fruit than jam. They also questioned the legal basis of setting standards for commercial products based on homemade recipes.

Anticipating judicial challenges, a specific statute Section 401 was introduced in the US Federal Food, Drug and Cosmetic Act (FFDCA) 1938 (1), authorising the FDA to set legally binding standards of identity.

Once again the FDA's authority to fix such standards came up before the courts regarding farina, enriched farina, and other flour mill products. In the Indian context this would mean, atta, fortified atta or protein-rich atta.



not available in PFA 1954 except that it was an adulteration Act. Section 18 of FSSA 2006, requires substantial evidence among other conditions to be

fulfilled before any standard is made.

The US FDA produced about 300 standards of identity covering 20 food categories, and Canada has about 500. Codex Alimentarius has over 200 "commodity standards" for individual foods or food groups. India has approximately 400. Standardized foods represent a small percentage of the over 30,000 foods on retail shelves. Specifications such as moisture, acidity, pH, etc are typically spoilage parameters requiring elementary lab analysis and enforcement. As every food will spoil, there is a propensity and attractiveness towards more product standards. Despite legislative intent to consolidate all food laws into a single one under the FSSA, 2006, the penchant for duplicating standards persists.

Meanwhile, since the introduction of standards in 1938, a wave of regulatory transformation has taken place. With the establishment of horizontal standards for safety, composition and consumer information, keeping both, general and specific standards addressing the same issue has led to confusion and uncertainty. For example, under the Nutrition Labelling Education Act (NLEA 1990), the framework for naming foods

may not comply with the statement of identity of product standard. The FSS (LD) 2020 provides better clarity in the naming of foods.

Where a standard specifies an "essential ingredient" establishing compositional criteria, the name assigned therein should be used; in all other cases, the common or usual name applies. This is the case for jams, juice, margarine or chutneys where standards of identity specify minimum amounts of certain essential ingredients. Further, when general standards - FSS(AC) 2018- provide clear definitions for nutrient content claims (free, low, light and less ) covering all foods, consumers are well informed before purchase. A low-sugar jam using safe and suitable sweeteners can now be truthfully claimed as a "low-calorie jam". And the Codex Food Category System (GSFA) adopted in FSS (FPS & FA) 2016, regulates additives in foods and amounts, whether standardized or not. Good regulatory practice (GRP) should require administrators to monitor and update standards to prevent overlap and consequent implications. Otherwise, apart from compliance becoming burdensome, the perils of litigation make businesses more vulnerable.

The lower court held that standards of identity that excluded the addition of nutrients are "entirely speculative and conjectural" and would not justify the premise that such regulations would "promote honesty and fair dealing in the interest of consumers". Furthermore, it held there was no evidence of consumer confusion to justify separate standards for farina and enriched farina when labelling described the product clearly. The US Supreme Court, however, disagreed providing its reasoning.

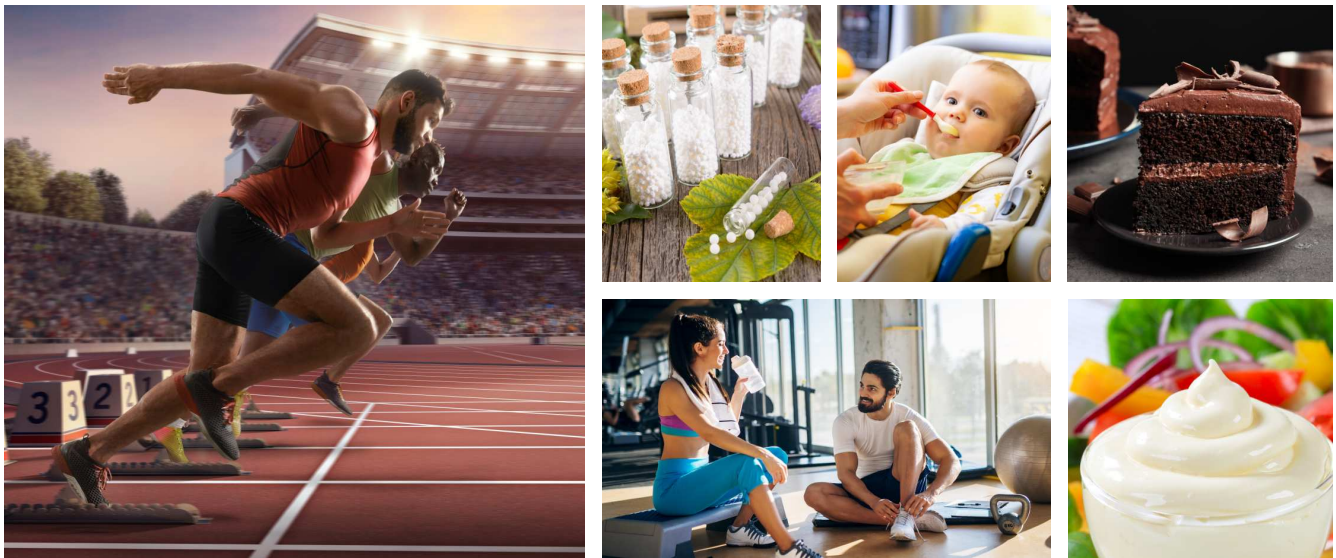
It held that the FFDC Act does not permit courts to 'substitute their judgment' for that of the agency (FDA) promulgating them. Section 401 explicitly states 'whenever in the judgement of the Secretary' such action that will promote honesty and fair dealing in the interest of consumers he shall promulgate regulations fixing and establishing for any food under its common or usual name .... a standard of identity. The Court therefore concluded that FDA determination is the controlling factor, if based on 'substantial evidence of record, and if within statutory and constitutional limitations'. Merely stating 'consumer interest' is insufficient without substantial evidence on record. Unlike the FFDC Act, such specific provisions were





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The intent to reduce standards began in the 90s following the FAO/WHO Conference on "Food Standards, Chemicals in Food and Food Trade" which highlighted a horizontal approach to developing provisions related to the health and safety of consumers and facilitation of international trade(2). Commodity standards should simply cover provisions necessary for consumer protection related to health, safety and fraud. Other provisions relating to styles, types of packs, sizes, defects, etc. should be limited to special circumstances. Another important shift is to focus on common characteristics of groups of commodities, rather than individual commodities. As a result several specific standards (e.g. for fresh and processed fruits and vegetables) have been revoked and incorporated into more general standards (2).

While global thinking discourages individual

standards, government policy has moved to direct actions insisting that regulators remove standards as a

pre-condition to making new ones. Aptly named the Red Tape Challenge, the "One-in, Two-out" rule, introduced in the UK (2013), prevents the creation of new regulations tying them to compliance costs. Regulators have to remove or modify existing regulation(s) to the value of £2 of savings for every pound of cost imposed. Compliance costs per regulation are the total costs borne by the government and businesses, including prosecution expenditures. Attaching a revenue factor to controlling standards is measurable and sensitizes both the regulator and the regulated. Within a year, the proportion of businesses that view regulations as burdensome dropped. The US follows a similar principle that any incremental cost associated with new regulations should be offset by costs associated with at least two prior regulations. These countries share food control systems similar to FSSA 2006 as does Codex.

This alone should convince policy makers that a standards management policy is urgent and important. Otherwise, there is nothing to induce drafters to ask the question, "Why this standard". The era of the hapless consumer is no longer a tenable incentive for releasing standards. However, standards are made for a purpose and in getting rid of something worthless; something valuable should not be lost.

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# MAKE THE RIGHT SHIFT FOR BETTER MANAGEMENT OF MENOPAUSE

## AUTHORS



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Ageing is deterioration of the physiological functions that are necessary for survival and fertility over a period of time. Senescence brings a variety of changes across body's systems. An individual's life continuum, each characterized by certain features has multiple stages. For a woman, considerable hormonal changes happen with age - the life stages are (i) infancy, (ii) puberty, (iii) reproductive age, (iv) climacteric period, and (v) elderly years.

The end of reproductive phase in woman is marked by a

physiological process termed as menopause. Menopause is a normal condition that involves complete cessation of menstrual cycle for at least 12 consecutive months (permanent cessation of ovarian function). This physiological transition where ovaries begin to lose their function is gradual.

Millions of women experience the transition of menopause every year. The symptoms of menopause appear to be specifically related to hormonal changes. Menstrual cycles length and regularity varies with every woman. In India, the trend of menopause has been reported to be earlier when compared to

other developed countries. 45 - 55 years is when a natural menopause occurs as per community-based studies. The start-age of menopause is probably genetic. Usually, mothers and daughters experience menopause at about the same age. Menopause maybe reached earlier in case of excessive smoking or have had a lot of children. Other factors being - length of a woman's menstrual cycle, underweight or overweight. For some women, the beginning of menopause can be quite unnoticeable whilst noticeable symptoms for certain others. The periods maybe be lighter or heavier, and gaps between periods can be irregular. Perimenopause or pre-menopause is usually those one or two years leading up to a woman's last menstrual period, whilst the time afterwards is referred to as post-menopause. The body has to get used to the new balance of hormones and this transition can take a few years.



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# MENOPAUSE

## Physiological changes during menopause:

Women are subjected to various physiological changes in life during this period like (i) decreased muscle mass, (ii) decreased oestrogen levels, (iii) low energy needs, (iv) headaches, (vi) more prone to UTI, (vii) risk of osteoporosis. Muscle and bone tissue coincide due to a functional relationship and menopausal hormonal changes are known to lead muscle and bone depreciation. Fatigue or low energy levels and decrease in oestrogen levels during menopause may also trigger mood dysregulation symptoms like distress, irritability etc. Furthermore, although more than 80% of women experience menopausal symptoms, there is variation in each woman's personal experience.

Many factors can play into the physiological processes of menopause. These factors comprise of diet, body mass index, exercise, ethnicity, smoking, overall gynaecologic health etc. The 3 broadly classified symptoms are:

- (i) Vasomotor
- (ii) Vaginal
- (iii) Insomnia and Mood Changes

## Vasomotor symptoms:

Vasomotor symptoms are considered cardinal symptoms of menopause as they afflict most women. The duration,

frequency, and severity vary amongst women. Upto 85% women report hot flashes, with as many as 55% reporting the same even before the onset of the menstrual irregularity. Resetting and narrowing of the thermoregulatory system in association with fluctuations in or loss of oestrogen production seems to be the most purported theory.

## Vulvovaginal atrophy:

Vulvovaginal atrophy unlike vasomotor symptoms needs treatment and does not improve with time. Urogenital tissues are very sensitive to the changes in oestrogen during menopause transition, followed by sustained low levels after menopause. 27% to 60% of women according to population and community-based studies report moderate to severe symptoms of vaginal dryness in association with menopause. Additionally, uterine prolapse and shortening and narrowing of vagina can occur, which can lead to dyspareunia.

## Sleep disturbances and insomnia:

Change in hormones caused by menopause along with ageing may cause compromise in sleep quality which makes women report sleep concerns, twice as much as men. Further, actigraphy studies indicate as much as 25 minutes of sleep per night can be lost in a woman's late reproductive years.

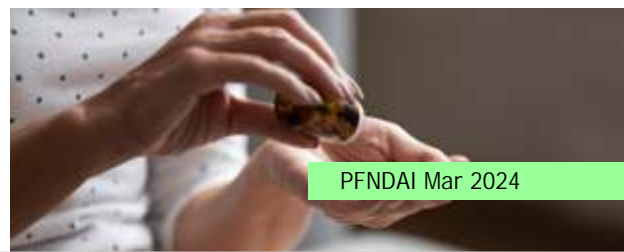
## Nutrition during menopause:

A balanced diet containing all food groups in adequate amounts along with regular

physical activity and adequate sleep are key for better management of menopausal symptoms and its related health concerns.

**1. Muscle health:** Menopause is associated with hormonal changes that also drive a decline in the muscle mass and muscle function of the body. Consumption of protein helps to maintain muscle mass, repair tissues and prevent weight gain when paired with regular physical activity. Protein also helps stabilize bone density. A minimum of 0.8 to 1g protein per kg body weight should be included in the daily diet. Some of the rich sources of protein include egg, soybean, pulses, lean meat, milk & nuts etc.

**2. Bone health:** Menopause stands to be one of the biggest risk factors of osteoporosis. Due to the low estrogen production that occurs during menopause there is an accelerated bone loss and low bone turnover, which increases the risk of osteoporosis in menopausal women. A well-balanced diet containing the pro-bone nutrients such as calcium, protein, Vitamin D, Magnesium and phosphorus promote bone health. These nutrients are known to significantly increase bone mineral density and reduce the risk of fractures that tend to increase during menopause. In daily balanced diet, include good amounts of egg, mushrooms, dairy products and dark green leafy vegetables as they are rich in the pro-bone nutrients.



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**3. Gut health:** One of the contributing factors to overall human health is the body's gut microbiome. Menopause related hormonal changes alters the gut microbiota by lowering its diversity which can influence low immunity, slow digestion rate and increase metabolic disorder risk. Probiotics and dietary fibers help promote a good gut by improving gut barrier function, normalizing the gut mucosa permeability and immune response modulation etc. Adequate intake of dietary fiber also helps to slow down the carbohydrate absorption, add satiating value, and improve bowel function along with positively influencing bacterial flora and reducing risk of metabolic disorders. Include a minimum of 400g of vegetables, one serving of fruit and a minimum of 35g of nuts & seeds in your daily diet along with good sources of probiotics such as yogurt, banana, pickled vegetables, probiotic curd etc.

### Management of menopausal symptoms

As mentioned earlier, some of the common symptoms associated with menopause include hot flashes, headaches, night sweats, mood changes, vaginal dryness

etc. To manage these symptoms, consume a healthy balanced diet that includes complex carbohydrates such as whole grains & millets, protein from nuts, seeds, legumes and

dairy, healthy fats such as PUFA & MUFA. Certain key micronutrients that help manage the symptoms include magnesium, folic acid, zinc and Vitamin E. Some of the sources of these nutrients are dark green leafy vegetables, beans, egg, seafood, groundnuts, sunflower seeds etc.

### Superfoods for menopause:

Some of the superfoods that have beneficial properties for better management of menopause are:

#### 1. Soybeans

Soybeans possess an excellent nutritional and functional food profile. Globally known as the most significant seed legume, it contains 36% protein along with isoflavones - an important category of phytoestrogen. Phytoestrogen are estrogen mimicking compounds which help in reducing the post-menopausal syndromes, especially hot flashes and vaginal dryness by making up to the decline of the endogenous estrogen hormone. Include

this legume as a part of your diversified balanced diet in various forms such as paratha, curries, soymilk etc.

#### 2. Millets

Millets also known as 'nutricereals' or 'Sri Anna' are rich sources of many essential nutrients that are specifically needed by women across different life stages including menopause. They confer hormonal health, build immunity and support management of metabolic disorders. Consumption of millets specifically kodo



milletts which has a high mineral content has been studied as beneficial for post-menopausal

women who show signs of cardiovascular disease such as high blood pressure and high cholesterol. Low bone mineral density is seen during menopause due to calcium resorption, finger millet also known as 'Ragi' is known for its high calcium content can be included in the diet to increase BMD (Bone mineral density) and reduce the risk of osteoporosis.





**3. Yogurt**  
Fermented milk product such as yogurt is a good source of

probiotic that helps in modulating intestinal microbiota. It contains minerals such as calcium that is known to promote bone health. One study has shown that daily consumption of yogurt had decreased concentrations of bone resorption markers. Another study concluded that higher yogurt intake led to a lower risk of obesity in women during the menopausal transition. Yogurt can be included in daily diet as is or along with nuts, seeds or in the form of fruit smoothies.

**4. Flax seeds**

Flax seeds are a powerhouse of many essential nutrients such as protein, dietary fiber, essential fatty acids along with phytoestrogens. A study done with consumption of 100mg of flax seed powder showed significant reduction in hot flashes, bone pain and night sweating. In



another study it was shown that phytoestrogen-rich flaxseed had beneficial effects on the frequency and intensity of hot flashes indicating that it may decrease menopausal symptoms. Roasted flax seed can be consumed as part of daily diet as snack, mixed with yogurt, or powdered in smoothies or curries.

**5. Black Cohosh**

Herbs & traditional plants have been in use for the treatment of health issues for many years. One such plant is the Black Cohosh, that has been used extensively for women related health issues. In recent times too, Black Cohosh is broadly being used to alleviate menopausal symptoms such as hot flashes, night sweats, sleep disturbances etc. A meta-analysis demonstrated that black cohosh can be an effective option in treating the

menopause related symptoms. Black cohosh can be included in diet in form of tea or supplements (under medical supervision).



Nutrition along with other lifestyle changes including regular exercise, yoga, relaxation techniques, and meditation etc., can help women manage this critical transitional phase. These activities will also help with overall wellbeing, including good sleep routine and managing healthy body weight.

With time, the often-negative conception around menopause is gradually changing. Many women see menopause as a new phase in their lives. As this marks an important

milestone of a woman's lifecycle while bringing along some uncomfortable symptoms, good nutrition and healthier

lifestyle should be incorporated to make this a smooth transition period.

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# MULTI-SOURCE EDIBLE OILS: AN APPROPRIATE EMERGING SOLUTION FOR INDIAN COOKING (PART 2)

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Antioxidants in oils are essential for maintaining oil quality and imparting health benefits

## Antioxidants to help maintain quality of oils

As discussed above, PUFAs are known to have cardio protective effect but highly prone to degradation. Hence, there is a need to protect PUFA from deterioration (in oil and in body) which can be achieved using an antioxidant. Antioxidants, by definition, are molecules which prevent or inhibit the oxidation of other molecules. Antioxidants (AO) help in suppressing oxidative damage in the body by reacting with free radicals and directly or indirectly inhibiting their expression. Antioxidants

are typically used in foods and oils to preserve their quality for longer duration, thereby, enhancing the shelf life. They suppress oxidation reactions by participating in or interfering with the lipid autoxidation reaction by cascading through various mechanisms. Possible action of AO such as vitamin E (tocopherol) in maintaining the oxidative stability during continued frying episodes have been demonstrated (Adam et al, 2007).

In addition, antioxidants also help delay lipid oxidation and improve the shelf-life of edible oils and fats, including oils used for frying. Some of the antioxidants that have been studied for their efficacy and benefits in edible oils include the tocopherols; tocotrienols; squalene; phytosterols; phospholipids; rice bran oil-

derived oryzanol, corn or rice bran oil derived sterylferulates; sesame oil lignans such as sesamol, sesamin, and sesamol.

Tocopherols, the most widely dispersed antioxidants in nature, represent the primary antioxidants in vegetable oils. Tocopherols exert their utmost antioxidant activity when they are present at relatively low levels in vegetable oils. As free-radical scavengers, tocopherols play a significant role in protecting vegetable oils from oxidative degradation during frying.

However, not all oils have all the antioxidants and other beneficial components at adequate amounts to preserve the nutritive and quality benefits of oils.





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oil when blended with soybean oil improved its oxidative stability and reduced the chances of rancidity in fried product during storage (Chotimarkorn et al, 2008). A blend of

tibish) seed oil with peanut oil improved the stability and tocopherols content (Siddeeg et al, 2015). Hence, benefits of blending different edible oils w.r.t. product quality is well evidenced in science.

In such cases, exogenous addition of antioxidants in edible oils also helps prevent further deterioration.

Blending multisource edible oils and exogenous addition of AO provides a better profile of AO, bioactive lipids and other beneficial components which enhance the oxidative stability against frying conditions (Dhyani et al, 2018).

Blending soyabean oil (SO) & sesame oil showed a significant improvement in thermostability of the oil (Chung et al, 2006). Rice bran

canola oil and palm olein showed minimum losses of antioxidant and PUFA during repeated frying (Al Khusaibi et al, 2012). Coconut oil when blended with sunflower and rice bran oil showed greater oxidative stability with lesser peroxide formation than the individual oils (Bhatnagar et al, 2009). Soybean oil blends (sea buckthorn oil, camellia oil, rice bran oil, sesame oil and peanut oil) were more effective than soybean oil in increasing oxidative stability and radical scavenging activity (Li et al, 2014). Blending of seinat (*Cucumis milo* var.

### Antioxidants to Impart Health Benefits

Antioxidants are nutrients and other minor bioactive components that help in scavenging the reactive oxygen species (ROS) or reactive nitrogen species (RNS) also known as free radicals, by redox reactions. Such reactions require ample supply of AO to counter the oxidative stress environment generated in the cells. While these reactive molecules are beneficial in small amounts for certain conditions like anoxia and infections, very high amounts are instrumental in development of cardiovascular conditions like atherosclerosis.

### Antioxidants present in various edible oils and their protective functions in body

Oilseed	Substances with antioxidant activities
Rapeseed, canola	sinapine, benzoic and cinnamic acid derivatives, phenolic acid esters and glycosides
Mustard seed	sinapine, esters of phenolic acids
Soy beans	syringic, vanillic, ferulic, salicylic, <i>p</i> -coumaric acids and esters, chlorogenic, caffeic, sinapic acids, isoflavones and their glucosides
Peanuts	phenolic acids and esters, such as <i>p</i> -hydroxybenzoic, <i>p</i> -coumaric, syringic, ferulic, caffeic acids
Sunflower seed	chlorogenic, caffeic, <i>p</i> -hydroxybenzoic, <i>p</i> -coumaric, cinnamic, <i>m</i> -hydroxybenzoic, vanillic, syringic, gallic, and vanillic acids, epicatechin, catechin
Evening primrose seed	proanthocyanidines and their gallates, isoflavones
Linseed	sinapic, <i>p</i> -hydroxybenzoic, coumaric, ferulic acids, lignans and their glucosides
Cottonseed	sinapic, ferulic, <i>p</i> -hydroxybenzoic acids, quercetin, rutin
Sesame seed	lignans, coumaric, ferulic, vanillic, sinapic acids
Olive fruits, cakes	hydroxytyrosol, secoiridoids, flavonoids, lignans
Grapeseed	catechin, epicatechin, procyanidin

LDL particles which accumulate beneath the endothelial layers, when oxidized, form modified (oxidized, ox-LDL) particles. The oxidized particles then metamorphosize the monocytes in the blood into macrophages which further attract more LDL particles and accumulate them.

This progressive oxidation leads to the formation of foam cells which are trapped within the vasculature due to the excessive buildup of ox-LDL. This condition further causes provokes the adjacent endothelial cells to release lipids and enzymes which ultimately lead to progression of atherosclerosis.

In normal state, AO can stabilize and neutralize the free radicals, which commence the whole cycle of oxidation and accumulation, thus preventing oxidation of LDL particles leading to oxidative stress. Thus, getting the required levels AO through our daily diet is imperative to downplay the free radicals. Multisource edible oils can be a good source to obtain these AO.

### Proven Health Benefits of Multisource edible oils

With the balance of fatty acids (MUFA and PUFA) and adequate AO mechanisms, blended oils have been proven to positively impact the markers of metabolic syndrome. A synergistic blend of rice bran oil (RBO), with an optimal balance of MUFA and PUFA with AO (oryzanol) and safflower oil with high PUFA at 70:30 showed significant reduction in

plasma LDL cholesterol (LDL-C) versus single seed oils (Sugano et al, 1997). A blend of rice bran and safflower oil with AO technology, when consumed in moderation (33g/day) along with lifestyle modifications, resulted in significant lowering of LDL-C levels and showed positive impacts on inflammatory markers in hyperlipidemic subjects (Upadya et al, 2015).



Another blend of RBO and sesame oil at 80:20 with AO system showed significant effect on antihypertensive and lipid lowering actions (Devrajan et al, 2015).

A blend of RBO and sesame oil when fed for 12 weeks versus soyabean oil, improved glycaemic response in terms of fasting blood sugar (FBS), post prandial blood sugar (PPBS) and HBA1C in patients with type 2 diabetes (Hota et al, 2020). Olive oil is rich in monounsaturated oleic acid however low in other fatty acids- SFA & PUFA. Blending with an oil which is rich in n3PUFA will help in obtaining a

better fatty acid profile. Flaxseed is an oil rich in PUFA of which 80% is omega 3 which is an essential fatty acid and deficient in the Indian diet.



Hence, a multisource oil with olive and flaxseed is a good source of balanced fatty acids with high amounts of beneficial MUFA and omega 3 fatty acids. Studies have also shown that blended oils rich in omega 3 fatty acid (ALA), show beneficial effects on gut microbiota (Clostridia class) and improved lipid profile including reduced TG:HDL, apolipoprotein B (apo B), TC when 30g was consumed by hypercholesterolaemic subjects for 8 weeks. These benefits might be attributed to generation of butyric acid (Lim et al, 2022).

Multi sourced edible oils are customized according to Indian cooking habits, with attention to health. This category is governed by two regulatory authorities in India i.e. FSSAI and AGMARK for stringent monitoring and control on quality and safety parameters. Very few other food categories like baby food and packaged water have such controlled regulations. American Heart Association (AHA, 2000; 2018) also recommends usage of blends of non-tropical oils as rice bran and sesame as “better for you” options for the management of cardiovascular diseases.



level cooking for maintaining the nutritive and quality parameters of oils and foods to help achieve dietary recommendations, for managing NCDs by monitoring the mechanisms

contributing to normal and pathological aging, including oxidative stress, inflammation, and vascular dysfunction.

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Overall Benefits of Multi-sourced edible oils

Use of single seed oils does not provide a balance of fatty acids, AO and other beneficial components. Firstly, no single seed oil has the recommended optimal balance of beneficial fatty acids (MUFA & PUFA). Secondly, they do not have adequate amounts of AO and bio-actives to preserve the PUFA degradation. Hence, it is recommended by national and international health authorities to either:

- ◆ Rotate different oils
- ◆ Use a combination of oils
- ◆ Blend two or more single seed oils

However, rotating and combining oils can be a challenge at household levels. Industries are therefore, focused on developing multi-sourced edible oils to deliver maximum health benefits to consumers and to make it convenient for them for sustained usage. Multi-sourced edible oils provide the benefits of:

- ◆ Optimal balance of MUFA and PUFA
- ◆ Preservation of PUFA during shelf life and in body
- ◆ Other minor health components

Hence, multi source edible oils are a great solution for Indian household and commercial





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# MUSHROOMS: EDIBLE AND DELIGHTFUL FUNGI



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Mushrooms have been extremely popular due to their nutritional and therapeutic qualities. They are not only a popular food due to their unique flavour, but they also have many health advantages.

It is edible in a variety of forms, including canned, dried, pickled, powdered, and fresh. While some mushrooms are cultivated for culinary purposes, others grow in the wild and require careful identification to ensure their safety for human consumption. It can be processed to create a new product or included with any food preparation. There is a wide variety of mushroom goods in the market right now, including pickles, sauces, drinks, extracts, dried and canned mushrooms, supplements, etc (1). They are

a great source of proteins and are low in calories, cholesterol, fat, sugar, and sodium.

### Types of Mushrooms

There are wide varieties and types of mushrooms known to exist, but not all are edible. However, some of them are- White button (*Agaricus bisporus*), oyster (*Pleurotus ostreatus*), shiitake (*Lentinula edodes*), shimeji (*Hypsizygus marmoreus*), enoki (*Flammulina filiformis*), porcini (*Boletus Edulis*), etc. White button mushrooms,



worldwide, are the most widely grown variety of mushrooms. They have a firm texture, delicate flavour, and a

creamy white to pale tan colour. They are easily available, juicy, and tasty. They go by the name Champignon, cultivated mushrooms, button, etc. Out of all the mushroom varieties, it is the most prevalent and has the mildest flavour. This type makes up 90% of the mushrooms we consume. Its mild flavour contributes to its versatility. It tastes great in soups, stews, salads, and pizzas(2).

Oyster mushrooms are another variety widely eaten. They are mostly eaten in Chinese, Japanese and Korean cuisine. Because of their mild, savoury flavour and delicate texture, oyster mushrooms are loved all over the world. Even, Enoki mushrooms are popular in these cuisines. They are long, thin, white, and have a crisp texture and mild flavour.

They are used in soups, stir-fries, hot pots, salads, and other recipes. Asian mushrooms known as "shimeji" have a crisp texture and a savoury, nutty flavour. Because they grow on fallen beech trees, they are sometimes known as beech mushrooms.



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subjected to various pre-treatments such as blanching to minimize the negative effects of freezing. Various types of freezing methods include blast freezing, cryogenic

freezing, etc. Freezing helps to improve the shelf life for a longer period if stored at the correct temperature.

Canning of mushrooms is done to preserve them in vinegar, brine, oil, etc. For canning purposes, freshly harvested mushrooms are used. They are then washed, cleaned, and blanched to then filled into the cans along with the brine or oil. After exhausting the cans to eliminate air, they are heat sterilised, cooled, labelled, and packaged for consumption or storage (4).

Pickling is one of the oldest methods of preserving fruits and vegetables possibly second only to sun drying. Pickling is a traditional food preservation technique that uses oil, vinegar, spices, and salt as its primary ingredients. Spices including clove, garlic, red chilli, and turmeric are used to make pickled mushrooms, along with oil and salt. These pickles enhance the meal's palatability and make excellent appetisers.

### Uses of Mushrooms in Cuisine (5)

Mushrooms are very versatile and can be used to make tasty meals. Mushrooms are used in a wide variety of dishes, not only in India but also worldwide. They are used in curries,

gravies, omelettes, pasta, noodles, ramen, soup, pickles, biryani, and other rice preparations, etc.

Various types of mushroom products are available in the market. Dehydrated mushrooms are an important ingredient in products such as instant soups, pasta, ramen, etc. Various products, such as ready-to-eat mushroom biscuits, mushroom soup powder, mushroom sweets, mushroom ketchup, etc. are available.

Mushroom flour is also available in the market. It is a gluten-free product which can be a better option for people with celiac disease.

### Health Benefits of Mushrooms

Worldwide, mushrooms are regarded as a gourmet culinary item because of their distinct flavour and universal appreciation as a culinary marvel.

Due to their organoleptic quality, therapeutic qualities, and economic relevance, mushrooms are regarded as a delicacy with high nutritional and functional value. They are a unique and exotic food with a unique flavour, high protein content, and essential amino acids.



### Processing

Unless they are eaten fresh, mushrooms have a limited shelf life and are extremely delicate. They turn stale quickly at room temperature and lose their freshness in a day if they aren't treated or refrigerated. To ensure longer shelf life, they are processed. The first step in the processing procedure is washing the mushrooms to get rid of any compost or soil that may have stuck to them, and then blanching them for a short while to kill any enzymes (3).

Drying is one of the most common and widely used methods of food preservation. Because moisture is the best medium for microbial growth and multiplication, its removal will stop microbial activity. There are two methods for drying mushrooms: mechanical drying and sun drying. The most affordable and often used method is sun drying. Although, it is the cheapest method of drying, it takes a lot of time and manual effort. Mechanical drying can be done quickly and in a variety of ways, including air drying, microwave oven drying and tray drying. Dried mushrooms are used in soups, stews, pickles, and other recipes after being rehydrated.

Freezing is another method of food preservation. Before freezing the mushrooms are





Because of their high protein content, which includes a significant amount of vital amino acids and fiber, they offer a high nutritional value. Additionally, edible mushrooms offer a significant number of B Vitamins like B1, B2, B3, B5, B6, & B9. Fat-soluble vitamins like Vit D, Vit K1, & minerals such as calcium, iron, potassium, selenium, etc (6).

Edible mushroom consumption has been associated with a host of health benefits, including enhanced brain and gut health, immunity to type 2 diabetes, obesity, certain cancers, high blood pressure, and more. Antioxidants, such as those abundant in mushrooms, may be able to protect several cancer forms. These include colorectal, breast, and prostate cancers.

In order to maintain and grow healthy bones, vitamin D aids in the body's absorption of calcium. Many individuals only obtain vitamin D from supplements or the sun, but if you want to get it from your food, mushrooms might be the solution. Mushrooms that have been exposed to ultraviolet light, whether on purpose or accidentally, have noticeable increases in their vitamin D2 content. Consequently, mushrooms can contribute significantly to the diet's supply of vitamin D2. Diabetes mellitus can be managed with improved living standards, exercise, and a suitable diet.

Mushrooms, including *Agaricus subrufescens*, *Agaricus bisporus*, and others, are effective in controlling blood

glucose levels and diabetic difficulties due to their low fat, cholesterol, carbohydrates, protein, vitamin, and mineral content (7).

### Cultivation of Mushrooms (8)

In the past few years, mushrooms have emerged as one of the key components of Indian cuisine. Mushrooms are widely accepted because of their culinary value as well as their potential as a source of protein. Protein-wise, mushrooms outweigh a lot of fruits and vegetables. As they are regarded as a supplement to diets deficient in proteins, they are appropriately referred to as vegetable meat. The cultivation of mushrooms includes some steps like making compost, spawning, casing, pinning & cropping.



Composting involves mixing and wetting ingredients like bran, straw, urea, etc. in a rectangular pile, then aerobic fermentation occurs due to the growth and reproduction of microorganisms. This process releases heat, ammonia, and carbon dioxide as by-products. Forced aeration is commonly used in the mushroom industry. The compost develops as raw ingredients are converted by

microorganisms, heat, and chemical reactions, creating a food source suitable for mushroom growth. Adequate moisture, oxygen, nitrogen, and carbohydrates are essential for the process.

The first step in creating a spawn is to sterilise a mixture of millet grain, water, and chalk. Millet can be replaced with other tiny grains like wheat or rye. Up until around 1940, spawn was grown using sterilised horse dung that had been moulded into blocks; this type of spawn is known as block or brick spawn or manure spawn, but it is no longer used. After a small amount of mycelium is introduced to sterilised grain, the mixture is shaken three times every four days for a total of fourteen days during which active mycelial growth occurs. The substance is referred to as spawn once the mycelium has colonised the grain.

After spawn is spread all over the compost, it is well combined with it.

The casing is a top dressing used to form mushrooms in spawn-run compost. It acts as a water reservoir and a place for rhizomorphs to form, essential for mushroom growth. The casing should hold moisture to prevent moisture loss and support the mycelium.



After rhizomorphs grow in a casing, a pin structure is formed by the initials of mushrooms. They finally swell into a mushroom after going through the button stage of growth. 18-21 days after casing, harvestable mushrooms become visible. When room air is mixed with fresh air to reduce its carbon dioxide content, pins form. Ventilation should be kept to a minimum until mycelium is visible at the casing surface. Timing is very important. Crop quality and productivity are impacted by pinning.

Farm to farm, picking and packing techniques may differ. It is necessary to refrigerate freshly collected mushrooms. Mushrooms should be allowed to "breathe" after harvest, which is why it's better to store them in non-waxed paper bags rather than plastic ones.

Thus, it can be concluded that more production and consumption of mushrooms would contribute to improving the nutritional status of the Indian populace by offering a surplus supply of protein,

essential minerals, and vitamins. One of nature's most well-known and versatile gifts is mushrooms. Since the shelf life of fresh mushrooms is quite short, processing may be necessary to extend their shelf life. It can be processed to create a new product or included with any food preparation. There is a wide variety of mushroom goods on the market right now, including pickles, sauces, drinks, extracts, dried and canned mushrooms, supplements, cosmetics, and more.

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# UNVEILING THE GREEN ELIXIR: EXPLORING THE HEALTH BENEFITS OF CORIANDER

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Since time immemorial, plants have been essential to preserving human health and elevating the standard of living. One such amongst them is coriander, one of the earliest spices known to mankind. The leaves of which are called coriander leaves generally, otherwise also known as cilantro and Chinese parsley in some parts of the world.

Coriander (*Coriandrum sativum L.*), a member of the Apiaceae (*Umbelliferae*) family, is typically grown from seeds year-round. India is the world's largest producer, consumer, and exporter of coriander. Although it can grow in any kind of soil, including light, well-drained, moist, loamy, and light to heavy black soil, it prefers dry climates. Coriander can be used whole and processed. Both fresh leaves and seeds are commonly used in cooking.

In India, this well-known

Ayurvedic medicinal herb is called "Dhania". It is usually incorporated into salads and chutneys or used as a garnish. The fresh juice of coriander is very beneficial in treating many vitamin and iron deficiency ailments. One to two teaspoons of its juice mixed to cool buttermilk, is quite helpful in healing various ailments. Let's understand briefly why this famous garnish plays an important role in our health and well-being.

Its plant seeds, leaves, and roots all are edible, each of them having extremely different flavours and applications. The earthy flavour of coriander seeds develops when they are heated. The leaves of the coriander plant have a strong, citrusy flavour, and the paste of seeds can be utilized in doughs and preparations. Curried and masala-style Indian, Middle Eastern, and Asian foods, as well as soups and salsas, are among the many recipes that call for

coriander. While the seeds are used either crushed or dried, coriander leaves are often used as a whole.

The multipurpose herb has a wealth of health advantages. Numerous benefits assist general well-being that come from both its seeds and leaves. The potential health advantages of coriander are practically limitless, ranging from reducing blood sugar to increasing immunity, from skin cleansing to rejuvenation of hair as it is rich in magnesium, manganese, iron, and dietary fiber. In addition, coriander is an excellent source of vitamin C, and vitamin K. They also have trace amounts of calcium, potassium, phosphorus, carotene, and niacin.



Let's explore the myriad health benefits that coriander seeds and leaves have to offer:

**Coriander seeds:**

1) **Digestive health**- The ability of coriander seeds to aid with digestion is well known. They contain essential oils like petroselinic acid which promote the secretion of digestive enzymes, which help with digestion. By regulating bowel motions, the fiber content helps avoid constipation.

It relaxes tight intestinal muscles that cause the discomfort of IBS and other chronic gut conditions, much like an antispasmodic medication.

Tea made from coriander seeds significantly decreases discomfort, bloating, and stomach pain. (1)

In traditional Iranian medicine, coriander extract is also utilized as an appetite stimulant.

2) **Blood pressure**- It has been observed that eating this spice lowers blood pressure in those who suffer from hypertension. According to

studies, components of coriander interact with acetylcholine, a neurotransmitter, and calcium ions to help reduce blood vessel strain. (2)

It not only has a diuretic effect on the body but also helps positively modify gastrointestinal functions. Urine flow is increased with the aid of a diuretic. One can get rid of the extra salt that has built up in the system through urine.

By treating high blood pressure, one also lowers your chance of developing life-threatening diseases including strokes and blood clots.

A spoonful of coriander seeds can be soaked overnight in a glass of water. Then strain and consume this water the next day.

3) **Regulation of blood sugar**- The hypoglycaemic qualities of coriander seeds may help control blood sugar levels. It can assist in lowering blood sugar and promoting insulin secretion.

They are advantageous for those with diabetes or those at risk because they can enhance the release of insulin from pancreatic beta cells and boost insulin secretion. It is said that the ethanol extracts of seeds effectively lower blood sugar or serum glucose.

In fact, the impact is so therapeutic that those who take any kind of blood sugar-

lowering medications or those with low blood sugar are cautioned against using coriander products.

Drinking coriander seeds water first thing in the morning or incorporating this whole spice in your meals is the best way to take benefits of these seeds.

4) **Improves kidney functioning**- The antibacterial qualities of coriander seeds enable them to fight off a variety of infections. Shielding the kidneys from oxidative injury as well.

Because coriander seeds increase the kidneys' filtration rate, which speeds up the production of urine, they are useful in the treatment of urinary tract infections. It helps the body eliminate bacteria and toxins and reduces water retention. This protects the urinary system and keeps it clean.

Because it supports the kidney's cleansing function, it is also effective for kidney stones. It facilitates the natural flushing out of tiny kidney stones and helps regularize and relieve urine. It also aids in the relief of kidney stone and infection-related urination pain.



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## Coriander leaves:

**1) Detoxification:** The effects of heavy metals on your body, health, and general well-being can be severe. When a person comes in contact with farmed fish, contaminated water, dental fillings, tattoos, specific immunizations, and household goods, they get into the bloodstream. Mercury, nickel, uranium, cadmium, lead, and aluminium can lodge in one's bones and central nervous systems, building up over time and slowing down the mental and physical processes.

Chelation is the most popular method of detoxifying the body. Through the use of chelating chemicals that bind to heavy metal toxin ions and enable their dissolution and excretion in the urine, heavy metals can be removed from the body through the use of chelation therapy.

Chlorella is a type of green algae, and when combined, coriander and chlorella are an ideal combination for body detoxification. The coriander plant's leaves as well as stems have strong anti-inflammatory,

antiseptic, antifungal, antibacterial, and important chelating qualities. These properties allow the attachment and elimination heavy metals from the body through the excretory system.

(3).

A detox drink can be made with plain coriander leaves boiled in water with the addition of lemon and salt, or a smoothie with a handful of fresh leaves can be made.

## 2) Anti-anxiety properties-

According to certain studies, coriander may have anxiolytic properties that lessen the symptoms of anxiety. The chemicals in coriander have the potential to influence neurotransmitters and promote mental serenity. The primary ingredient in coriander, linalool, has a variety of neuropharmacological properties, including sedative, anticonvulsant, anti-anxiety, and anti-Alzheimer's disease properties.

Iranian traditional medicine has promoted *C. sativum* as a treatment for insomnia. It has been recommended that consuming 30 g of chopped fresh leaves or the plant's seeds with tea before bed will help with anxiety and sleeplessness. (4)

The primary ingredient in *C. sativum* and most of its neuroprotective actions may have these qualities because they are anti-inflammatory and antioxidant.

**3) Skin health-** Strong antioxidants like vitamin C are

found abundant in coriander, which also combats free radicals that harm the skin. Because coriander absorbs extra oil, it works well for oily faces.

Coriander calms and cools skin and is a natural antibacterial, antibiotic, and antifungal. It also aids in the treatment of skin conditions like smallpox, dermatitis, and eczema. Coriander seed particles are small enough to scrape and deeply wash the skin. Blackheads and dead skin cells can be effectively removed by the scrub, which also revitalizes your skin. Coriander's essential vitamin and mineral content help to restore the elastic properties of the skin. (5)

It has vitamin A, which keeps the skin's mucous membrane healthy. It also lessens fine lines and postpones the appearance of wrinkles. Coriander tea, drink, or oil, all can work wonders for skin health.

**4) Immunity booster-** It has been demonstrated that the high vitamin and antioxidant content of coriander helps reduce inflammation and support the immune system. Frequent ingestion may improve the body's defences against diseases and infections.



According to a test-tube study, the antioxidants in coriander seed extract reduced inflammation and inhibited the growth of cancer cells in the breast, colon, lung, and prostate. (6) Numerous antioxidants included in coriander guard against the harm that free radicals can do to cells. These substances include tocopherols, quercetin, and terpinene; they have antioxidant, anticancer, immune-stimulating, and neuroprotective properties.

Beyond garnish, coriander can be the highlight of several dishes worldwide. Right from Maharashtra's famous 'Kothimbirvadi' or Gujarati's 'Dhania thepla' to be the core component in Thai soups and salads, and Vietnamese pho.

In conclusion, this plant is appropriately referred to as the "herb of happiness" because of its many applications as well as its preventative properties against several chronic illnesses. Coriander seeds and leaves offer a myriad of health benefits that extend beyond their culinary use. From

digestive health to cholesterol management, anti-inflammatory effects to immune system support, the holistic advantages of incorporating coriander into your diet are substantial. Embracing this versatile herb can be a flavourful and nutritious way to promote overall well-being and vitality. As always, it is advisable to consult with a healthcare professional before making significant dietary changes, especially for individuals with specific health conditions or allergies.

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# THAKAAN GONE ENERGY ON



Glucose Based Beverage Mix (14.1.4.3)  
(Proprietary Food)



©Creative visualization. Glucon-D does not contain any fruits. Fruits are for creative depiction. ^Contains Glucose. Glucose is an instant source of energy. ™Vitamin C helps support immunity. Glucon-D flavour variants are a rich source of Vitamin C. It contributes to min. 17% of Adult RDA (ICMR-2020) of Vitamin C per serve, when prepared according to the label instruction. Vitamin D helps support immunity. Glucon-D regular is a rich source of Vitamin D<sub>2</sub>. Per Serve Vitamin D<sub>2</sub> contribution: 17% of Adult RDA (ICMR-2020). Refer individual pack for more information. ®Registered Trademark.



# CONFERENCE ON TODAY'S FOODS: CONVENIENCE, SAFETY AND HEALTH SESSION 1: "PROCESSED FOODS: AN INTEGRAL PART OF OUR DIET"

AUTHOR

**Ms Anuja Padte,**  
Food Scientist, PFNDAI



Protein Foods & Nutrition Development Association of India (PFNDAI) organized a conference on Today's Foods: Convenience, Safety and Health. The conference consisted of 2 sessions. The 1st session was on "Processed Foods: An Integral Part of our Diet" which was held on 16th Feb 2024 at 3 pm virtually through zoom & 2nd the session is on "Efficacy & Safety of Adjuncts to Food" which will be held on 15th March 2024.

The session began with Ms. Simran Vichare, Nutritionist, PFNDAI welcoming everyone and appreciating the sponsors for their support.



The Conference was sponsored by: Hindustan Unilever Limited, Mother Dairy Fruit & Vegetable, Nestle India, Amway India Enterprises, Vista Processed Foods, Fine Organic, and Mondelez India Food, the Speaker Sponsorship was provided by: Nestle India Ltd, Marico Ltd, and ITC Ltd & the Souvenir Advertisement sponsorship was provided by Coca-Cola, Roquette India Pvt Ltd, JRS Rettenmaier, Sensient India Pvt Ltd, Aruna Industries, Lucid Colloids, Azelis India Pvt Ltd & Hershey India Pvt Ltd.

The keynote address was delivered by Dr Shatadru Sengupta, Vice President - Legal, Hardcastle Restaurants, Pvt Ltd., and Chairman of PFNDAI. He



welcomed and thanked everyone present and highlighted the significance of processed food for consumers. Processing provides necessary nutrients that are often lacking in regular food intake. Some people express concern about preservatives and additives in processed food, but it's essential to recognize that everyday items like salt act as preservatives, and additives serve specific purposes backed by scientific evidence.

The belief that homemade food is healthier than purchased food lacks scientific backing. He also mentioned that the PFNDAI aims to promote awareness of relevant scientific aspects, and this conference is a testament to that commitment.

**Dr Shashank Bhalkar,**  
Executive  
Director,  
PFNDAI

extended a warm welcome to all the delegates, speakers, panel members present. He explained that food processing has been around since humans began farming. Basic techniques like sun-drying, threshing, and winnowing were used to make crops edible.

More advanced techniques were developed as people diversified, creating processed foods that could be transported over long distances. Today, processing methods preserve nutrients, creating foods that are both secure and nutritious. During the session, we will discuss the benefits of processed foods. Finally, he thanked all our sponsors for supporting the conference.

The theme address was delivered by **Prof Dr Jagadish Pai,** Editor, PFNDAI.

He explained the significance of processing and the role it plays in the importance of processed foods



in today's time. He emphasized that in the vast landscape of consumer choices, the food we eat plays a crucial role in our well-being.

Therefore, every packaged food item available in the market must have a label that includes comprehensive nutritional information. This information empowers consumers to make informed decisions about what they eat. After his speech, he welcomed all the speakers, panellists, and the panel moderator, setting the stage for further discussion.

**Ms. Simran Vichare,** Nutritionist, PFNDAI, welcomed the first speaker for the session. **Ms.**

**Meenu Yadav,** Principal Manager-Technical Regulatory Affairs, Marico Limited, delivered a

wonderful presentation on "Contributions of Processed Foods in Providing Nutrition & Food Safety." Ms. Meenu's presentation provided a thorough insight into the critical role of food processing in ensuring food safety and nutrition. She defined food processing as a scientific and technological activity involving procedures like washing, cutting, heating, freezing, and packaging, which alter the natural state of

food. The impacts of food processing on food are diverse, including enhancing safety by controlling hazards, maintaining nutrient levels for improved nutrition, ensuring quality in sensory characteristics, and adding value through convenience and shelf-life.

The importance of fortification in addressing micronutrient deficiencies in India is underscored, with fortification identified as a complementary strategy alongside diet diversification and food supplementation.

Her presentation was concluded by emphasizing the well-established benefits of processed foods on health and safety, acknowledging the evolving nature of the food system.

Ms Meenu highlighted the need for collective action to improve the health of current and future generations, summarizing the multifaceted impact of food processing on food safety and nutrition.





The second speaker for the session was **Dr Sesikeran**, Chairman-Scientific Advisory Committee, Hon. Scientific Director-PFNDAI, Former Director, NIN (ICMR), Hyderabad. He delivered an excellent presentation on the topic: **"Glycaemic Index and Glycaemic Load in Management of Blood Glucose Levels"**. Dr Sesikeran commenced his presentation by defining GI as a metric of a food's ability to elevate blood glucose when compared to pure glucose.



This metric categorizes foods based on their GI values and describes how to calculate the whole meal GI. He emphasized the impact of different food compositions on postprandial plasma glucose levels and highlighted the significance of fibre in predicting glucose levels. He also explored the factors that affect glycaemic response, such as ethnicity, metabolic status, and eating habits.

Furthermore, he compared postprandial glycaemia in

different ethnic groups and suggested the potential benefits of low-GI diets for people with diabetes mellitus. Additionally, he provided insights into managing glycemic response through dietary

strategies, emphasizing the significance of consuming whole foods, and incorporating specific nutrients to lower glycemic response to high-GI carbohydrates. He concluded his talk by stressing the need for individualized dietary considerations for people with diabetes and highlighting the importance of monitoring postprandial blood glucose spikes.

The last speaker for the session was

**Dr N Ramasubramanian**, Director - V R Food Tech. He presented on the topic **"Processed Foods - Benefits and Misconceptions and Challenges"**.



Dr N. Ramasubramanian discussed the pivotal role of food processing in his presentation, emphasizing its historical significance in making food edible, preserving it, and extending shelf life. The shift from home-based to industrial processing was attributed to societal

changes like population increase and women entering the workforce. Challenges associated with processed foods, such as nutrient and taste loss and negative perceptions, were addressed.

The presentation suggested solutions like food fortification, non/reduced thermal processes, and controlled atmosphere packaging. The NOVA system classified processed foods, highlighting health concerns with ultra-processed foods due to high levels of calories, salt, sugar, and fat. The document advocates collaboration for minimizing negative effects, focusing on innovation, consumer education, equitable regulations, and the concept of "Thoda Kum" by FSSAI.

A star rating system for nutritional assessment is recommended, considering both concerns and positive aspects. The presentation was concluded by stressing the need for collaborative efforts to address processed food issues equitably, emphasizing consumer, industry, and regulator cooperation to foster positive change.

After every presentation, the speakers eagerly addressed all the questions raised by the attendees.



Ms Simran Vichare introduced the moderator and members of the Panel discussion. The Panel Discussion started wherein Dr Jasvir Singh Director, Head of AMETI Regulatory Affairs (IFF) was the Panel Moderator.



There were 4 Panel members present namely, Ms Naaznin Husein, Director Freedom Wellness Management,



Dr Jagmeet Madan- National President, IDA,



Mr. Jitin Garg - Scientific and Regulatory Affairs Lead - India, Mondelez &



Dr Sidhishwarr Rindhe- Plant QA Head- Pan India, Vista Processed Foods



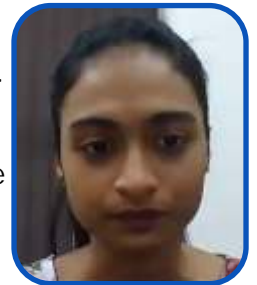
The panel discussion addressed various aspects of processed foods and their impact on health.

Key questions were posed to the panellists to explore the role of processed foods in a healthy diet, consumer education, convenience, moderation, advantages of processing, and the connection to food security.

In summary, the panel discussion highlighted the potential benefits and challenges of processed foods in maintaining a healthy lifestyle, emphasizing the need for informed choices, education, and collaboration between stakeholders.



At the end of the conference, Ms Samreen Shaikh, Junior Food Technologist at PFNDAI, presented a vote of thanks. She expressed her gratitude towards all the speakers, panel members, and the PFNDAI team for their support in making the session successful.



She also thanked the conference sponsors, speaker sponsors, and souvenir advert sponsors for their contributions. Lastly, she thanked the attendees for patiently listening throughout the conference.

The entire webinar recording is available on the following link:  
<https://www.facebook.com/pfndai/videos/308565945544623/>



# REGULATORY ROUND UP



**AUTHOR**  
**Dr Shashank Bhalkar,**  
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Dear Readers,

Please find below new notifications, orders, etc. since the last round-up

not an ORS formula as recommended by WHO".

FBOs shall also comply with the disclaimer on the front of the pack of the product that, "This is only brand name or trademark or the fancy name and does not represent its true nature." FBOs can select an appropriate term.

This is a good step to help consumers select the correct product while they are looking for the ORS with WHO formula.

[Time-bound processing of applications for Licenses marked for inspections](#)

This advisory is about time-bound processing of applications for licenses where inspection is required. It is advised that no pre-license inspection be done except for the products where it is



mandatory. Any inspection for non-mandatory categories should be with proper justification.

Such inspection is to be conducted within fifteen days. In case it is not done in fifteen days, Designated Officers should recall the application and grant the license by bringing it back to the scrutiny stage in FoSCoS.

The inspection must be carried out immediately in case it is necessary. This is another good step by Food authorities to increase ease of doing business.



[Order on Usage of the term "ORS" along with brand names](#)

This order is regarding the products that are registered with the suffix or prefix "ORS" in their names. Such manufacturers shall have the declaration, "The product is

# RESEARCH IN HEALTH & NUTRITION

## People Are Using ChatGPT for Nutrition Advice – The Results Are Dangerous

BY MIRIAM FAUZIA, Inverse, OCT. 31, 2023

There's probably no greater struggle in our world of mouth-watering food porn and convenient food-delivery apps than healthy eating. Creating tasty yet nutritionally balanced meals, feels like a chore with too many extra steps: researching recipes, buying groceries, cooking, and meal prepping.

In this day and age of generative artificial intelligence, some netizens are turning to chatbots to attempt to build a better relationship with food. On social media forums like Reddit, users have been sharing their experiences using ChatGPT, trading prompts, hacks, and tips for meals that are, for example, high in protein and low in carbohydrates or "good for weight loss." The same goes for TikTok where there's even more specific advice, such as creating "hormonally balanced" meals for reproductive issues like polycystic ovarian syndrome.

But using ChatGPT to eliminate

the guesswork out of a healthy, nutritious lifestyle reveals an inconvenient truth about both the state of nutritional science and the way ChatGPT interprets scientific studies. Research reveals poor science lurks within the algorithms, which could contribute to potentially life-threatening risks such as disordered eating habits or nutrition advice that could trigger serious health problems.

Since its launch in 2022, ChatGPT has seen a plethora of uses. When it comes to nutrition and diet, there's a lot of information on the internet that may not be scientifically valid or applicable for humans, says Lindsay Malone, a registered dietician who practices integrative and functional dietetics at Case Western Reserve University. "There are so many health and wellness blogs or websites that may have statements that aren't necessarily false. They may be based on animal data or smaller studies where we have evidence to move forward with a large study, but we can't quite change our recommendations yet until we've seen it proven on a larger human scale," she tells Inverse.

ChatGPT does make a good effort to include fruits and vegetables into every meal for diets like the Mediterranean diet or Dietary Approaches to Stop Hypertension (also known as DASH). For example, with a Mediterranean diet – which the AI describes "emphasizing fresh produce, whole, grains, healthy fats, lean protein, and moderate wine consumption" – it recommended a veggie-packed omelette for breakfast cooked with olive oil and toasted almonds with rosemary as a snack. For those following DASH, ChatGPT recommends avoiding saturated fats, sugars, and sodium and instructs instead to use "herbs and spices" to flavour a lunch-time quinoa and vegetable bowl or low-sodium soy sauce for a vegetable stir fry. "A registered dietician would do some background information – learn about your goals, if there are any health conditions or food allergies, or if a person is looking to change their health in some capacity such as their blood cholesterol or their body composition."

However, one 2023 article published in the Journal of the Academy of Nutrition and Dietetics, found that specifying a diet didn't mean the chatbot always minded those dietary constraints. As an experiment, the article's authors asked ChatGPT to provide a diet ideal for people whose kidneys are failing and are on dialysis. The AI provided an accurate response such as lowering one's potassium and

phosphorous intake and consulting a “renal dietician.” But when it was asked to create a week-long menu, the foods included, like spinach and avocado, weren't optimal for dialysis patients and did not provide any forewarning, according to the authors.

Another 2023 study published in the journal *Nutrition* explored using ChatGPT for creating food allergy-friendly meals. The researchers focused on 14 food allergies, which included gluten, eggs, fish, crustaceans, molluscs, nuts, and dairy products. Most of the menus the chatbot created correctly left out the food allergen specified. But for nut-free diets, ChatGPT included almond milk, one of the most severe, life-threatening food allergies.

Perhaps the gravest danger of ChatGPT's advice is that it has the potential to reinforce or encourage disordered eating. This isn't a new cause for concern with generative AI. This past summer, the National Eating Disorder Association (NEDA) announced it was temporarily shuttering a helpline chatbot named Tessa — meant to replace human staffers — because it was giving weight loss advice to people with eating disorders. An August report released by the Center for Countering Hate (CCDH) found that AI chatbots generated harmful eating disorder content 23 percent of the time. In 94 percent of this harmful content, the bot provided warnings that the advice was dangerous, though all the information was still readily available. No one should blindly listen to

ChatGPT's “health” recommendations, experts say. But they also say it is still possible to incorporate the chatbot in your nutritional planning as long as a professional is involved, such as a registered dietician.

### Light exercise could be the key to reversing childhood obesity linked to sedentariness

Science Daily December 21, 2023

Increased sedentary time as a child through adolescence is directly linked to childhood obesity, but new research has found light physical activity may completely reverse the adverse process.

The study -- conducted in collaboration with between University of Exeter, University of Eastern Finland, University of Bristol, and University of Colorado and published in *Nature Communications* -- is the largest and longest follow-up to objectively measure physical activity and fat mass, using the University of Bristol's Children of the 90s data (also known as the Avon Longitudinal Study of Parents and Children). The study included 6,059 children (53 percent female) aged 11 years who were followed up until the age of 24.

Recent reports concluded that more than 80 percent of adolescents across the globe do not meet the World Health Organization's (WHO) recommended average of 60 minutes a day of moderate-to-vigorous

physical activity. Yet results from this new study shows that moderate-to-vigorous physical activity is up to ten times less effective than light physical activity in decreasing overall gain in fat mass.

Dr Andrew Agbaje of the University of Exeter led the study and said: “These new findings strongly emphasise that light physical activity may be an unsung hero in preventing fat mass obesity from early life. It is about time the world replaced the mantra of ‘an average of 60 minutes a day of moderate-to-vigorous physical activity’ with ‘at least 3 hours a day of light physical activity’.” Light physical activity appears to be the antidote to the catastrophic effect of sedentary time in the young population.” During the study, a waist-worn accelerometer measured sedentary time, light physical activity, and moderate-to-vigorous physical activity among participants at ages 11, 15, and 24 years. During the 13-year follow-up, sedentary time increased from approximately six hours a day in childhood to nine hours a day in young adulthood. Light physical activity decreased from six hours a day to three hours a day, while moderate-to-vigorous physical activity was relatively stable at around 50 minutes a day from childhood through young adulthood.





Both male and female children gained an average of 10kg of fat mass during growth from childhood until young adulthood. However, sedentary time potentially contributed 700 grams to 1kg of fat mass (approximately seven to ten percent) of the total fat mass gained during growth from childhood until young adulthood. A 1kg increase in fat has been linked to a 60-percent higher risk of premature death in a person's early 50s.

Each minute spent in light physical activity during growth from childhood through young adulthood was associated with a 3.6-gram reduction in total body fat mass. This implies that cumulative light physical activity decreased total body fat mass by 950 grams to 1.5kg during growth from childhood to young adulthood, (approximately 9.5 to 15 percent decrease in overall gain in fat mass during the 13-year observation period). Examples of light physical activity are long walks, house chores, slow dancing, slow swimming, and slow bicycling.

In contrast, time spent in moderate-to-vigorous physical activity -- including meeting the 60 minutes a day recommended by the WHO -- during growth from childhood through young adulthood was associated with 70 to 170 grams (approximately 0.7 to 1.7 percent) reduction in total body fat mass. This study

confirmed the report from a recent meta-analysis of 140 school-based randomised controlled trials across the globe that engaging in moderate-to-vigorous physical activity had minimal or no effect in reducing childhood BMI-obesity.

### Poor diet quality during adolescence is linked to serious health risks

Science Daily December 13, 2023

**Diet quality among adolescents is among the worst across all age groups, putting young people at risk for heart attack, stroke, and diabetes, among other cardiometabolic diseases later in life.**

This study examined data from the Translational Investigation of Growth and Everyday Routine in Kids cohort. This study measured physical activity, sleep, and overall dietary guidelines for youth living in metropolitan areas of Louisiana, which are typically medically underserved and characterized by high poverty levels, food insecurity, obesity, and related diseases. Study participants provided a baseline data set with follow-up measures two years later.

Of the 342 eligible and enrolled adolescents, the final study sample included 192 participants with complete baseline and follow-up data. At baseline and follow-up, the adolescents were

asked to wear an accelerometer for at least seven days and complete two 24-hour dietary recalls for their food and beverage intake during research visits that included body composition, blood pressure, and clinical chemistry measurements and anthropometrics.

Considering overall eating patterns, the findings showed that adolescents with poor adherence to the 2015-2020 Dietary Guidelines for Americans and associated cardiometabolic risk factors continued these same patterns over the two years of the study, suggesting that the adverse effects of a poor-quality diet had already established the health risks these teenagers will face throughout life.

Dr Staiano concluded, "This study found specific dietary quality patterns associated with adolescent cardiometabolic risk factors. Promotion of nutrition knowledge is necessary, but knowledge is not consistently linked with food consumption behaviour. Identifying barriers to consuming a healthful diet and investigating effective strategies to overcome these barriers may curtail future health risks."





## Manipulation of gut microbiota with flaxseed could reduce breast cancer risk

Science Daily December 7, 2023

The researchers studied the effects of flaxseed lignans on the microbiota of young female mice. Lignans, fibre-associated compounds found in many foods and particularly plentiful in flaxseed, are associated with reduced breast cancer mortality in postmenopausal women. The researchers found that lignan components generate specific miRNA responses in the mammary gland.

miRNAs are short, noncoding RNAs that regulate gene expression by targeting the 3' untranslated region of target mRNAs. To determine whether the relationship between the microbiota and mammary gland miRNAs could be manipulated to reduce the risk of breast cancer, the researchers fed flaxseed lignan components to female mice to determine whether gut cecal microbiota profiles are related to miRNA expression in the mammary gland.

The cecum, the first part of the colon, located in the right lower abdomen near the appendix, is believed to have a role in production of short-chain fatty acids and has been



proposed to serve as a reservoir of anaerobic bacteria. One flaxseed oil lignan requires microbial processing to release bioactive metabolites, small-molecule chemicals produced during metabolism that influence physiology and disease -- in this case having antitumor effects.

The researchers found that the microbiota and mammary gland miRNA are related and that flaxseed lignans modify the relationship to be non-cancer causing. "If these findings are confirmed, the microbiota becomes a new target to prevent breast cancer through dietary intervention," said Elena M. Comelli, Ph.D., Associate Professor in the Department of Nutritional Sciences and the Temerty Faculty of Medicine, University of Toronto, the corresponding author on the paper.

## Cocoa extract supplement may benefit cognition among older adults with lower diet quality

Science Daily December 7, 2023

Cocoa extract has shown a potential protective effect on cognition but randomized clinical trials in older adults have had inconsistent results.

A new study of cognition in a randomized trial, known as the Cocoa Supplement and Multivitamin Outcomes Study (COSMOS), suggests that taking

cocoa extract supplements containing 500 mg per day of cocoa flavanols had cognitive benefits for older adults who had lower habitual diet quality at the time of enrolment in the study. However, cognitive benefits were not found among participants who already had healthy dietary patterns at the start of the study. The study, conducted by researchers at Mass General Brigham, included 573 older adults who underwent detailed, in-person cognitive testing and is published online in The American Journal of Clinical Nutrition.

Results from detailed neuropsychological assessments given over two years showed that daily cocoa extract supplementation, compared to placebo, had no overall benefits for global or domain-specific cognitive function. However, secondary analyses showed that participants with poor diet quality had cognitive benefits from taking the cocoa extract supplement. The findings from this study -- which was done among COSMOS participants who presented in-person for detailed cognitive testing -- are consistent with the results from an earlier study that used a web-based cognitive assessment given over the internet to a separately recruited set of COSMOS participants. COSMOS is an investigator-initiated large-scale, long-term clinical trial led by Brigham and Women's Hospital.



More than 21,000 older women and men were enrolled across the United States to participate in this randomized, double-blinded, placebo-controlled study to test whether taking daily supplements of a cocoa extract or a common multivitamin reduces the risk for developing heart disease, stroke, cancer, and other important health outcomes. Analyses of the data from COSMOS continue to yield insights about the connections between supplements and human health.

### Pregnant women are missing vital nutrients needed for them and their babies

Science Daily December 5, 2023

A study looking at the health of expecting mothers from high-income countries, including the UK, New Zealand and Singapore, found that 90 per cent were lacking key vitamins necessary for healthy pregnancies and the wellbeing of unborn infants.

Scientists from the University of Southampton, working with experts worldwide, surveyed more than 1,700 women and found most were missing essential nutrients found in abundance in meat and dairy products. These included

vitamins B12, B6 and D, folic acid and riboflavin which are essential for the development of foetuses in the womb.

Lead author and Professor of Epidemiology Keith Godfrey, from the University of Southampton, said the prevalence of vitamin deficiencies among women attempting to become pregnant in wealthy countries is a serious concern. He added: "The push to reduce our dependence on meat and dairy to achieve net-zero carbon emissions is likely to further deplete expecting mothers of vital nutrients, which could have lasting effects on unborn children. "Our study shows that almost every woman trying to conceive had insufficient levels of one or more vitamin, and this figure is only going to get worse as the world moves towards plant-based diets. People think that nutrient deficiency only affects people in underdeveloped countries -- but it is also affecting the majority of women living in high-income nations."

The study, which was published in PLOS Medicine, assessed 1,729 women between the ages of 18 and 38 at conception and followed many during subsequent pregnancies. It was undertaken by researchers from Southampton and its National Institute for Health and Care Research (NIHR) Biomedical Research Centre, the University of Auckland, National University of Singapore, and Agency for Science, Research and Technology, Singapore.

Results showed that nine out of ten women had marginal or low levels of folate, riboflavin, vitamins B12 and D around the time of conception, and that many developed vitamin B6 deficiency in late pregnancy. Co-author Professor of Paediatric Endocrinology Wayne Cutfield, from the University of Auckland, said while folic acid is recommended for women planning conception and during pregnancy, expecting mothers should be given over-the-counter multivitamins to reduce nutrient deficiencies.



### Beetroot juice supplement could improve health and enhance mobility for COPD patients, study finds

21 Dec 2023 Nutrition Insight

A team of London-based researchers reveal that a daily beetroot juice supplement may benefit individuals suffering from Chronic Obstructive Pulmonary Disease (COPD). The 12-week study, conducted at the Royal Brompton Hospital in London, underscores the potential of beetroot juice, which is rich in nitrate, to



## improve health outcomes in COPD patients.

COPD is a severe lung condition encompassing chronic bronchitis and emphysema, which affects approximately 400 million people globally. The disease not only causes breathing difficulties but also significantly restricts physical activity and increases the risk of heart attacks and strokes. “COPD cannot be cured, so there is a pressing need to help patients live as well as they can with the condition and to reduce their risk of cardiovascular disease,” explains Dr Apostolos Bossios, head of the European Respiratory Society’s airway disease assembly. “Patients taking part in this trial generally found the beetroot juice supplement acceptable and they saw benefits in terms of their blood pressure and mobility.”

The study, published in the European Respiratory Journal, included 81 participants with COPD, all of whom had a systolic blood pressure exceeding 130 mm of mercury, higher than the ideal range of 90 to 120 mmHg. The results show that patients who consumed the nitrate-rich beetroot juice experienced an average decrease in systolic blood pressure of 4.5 mmHg compared to the placebo group. Furthermore, their ability to walk improved significantly, with an average

increase of approximately 30 meters in a six-minute walking test.

Edited by William Bradford Nichols

## Gut-brain axis: Ketogenic diet may protect children with epilepsy

20 Dec 2023 Nutrition Insight

Researchers suggest that ketogenic diets may protect against epileptic seizures through changes in the gut microbiome of children on the diet and microbiome-induced changes in brain gene expression. Transplanting fecal samples of pediatric epilepsy patients on a keto diet into mice helped the mice become more seizure-resistant.

While the low-carbohydrate, high-fat and protein ketogenic diet is commonly used to address epilepsy in children who don’t respond to anti-seizure medications, the authors note that its use remains low due to difficulties in implementation, compliance with its strict requirements and side effects such as nausea, constipation and fatigue.

Understanding how a keto diet changes the microbiome could help develop new therapeutic approaches to incorporate these benefits. “Narrowing down the functions of the microbes that are beneficial toward seizure protection can

potentially lead to new ways to enhance the efficacy of the ketogenic diet or to mimic its beneficial effects,” says the study’s lead author, Gregory Lum, a postdoctoral researcher at the University of California (UCLA), US. Mice that received transplants taken after being on the diet for a month were more resistant to seizures than those that received pre-ketogenic diet fecal transplants. Moreover, the study published in Cell Reports found that the ketogenic diet altered essential microbiome functions related to anaplerosis — a metabolic pathway — fatty acid oxidation and amino acid metabolism in pediatric patients. These changes were preserved when the fecal matter was transplanted into mice.

The authors explain that microbiota-dependent increases in seizure protection were associated with changes in the transcriptome — a complete set of all the brain’s ribonucleic acid (RNA) molecules. They note that these changes may contribute to seizure protection. In recipient mice’s hippocampus and frontal cortex, transcripts were enriched, related to RNA processing, regulation and translation, signalling and cell cycle, cellular stress response and oxidative phosphorylation — reducing oxygen and generating high-energy phosphate.

By Jolanda van Hal



# FOOD SCIENCE & INDUSTRY NEWS

## Algae as a surprising meat alternative and source of environmentally friendly protein

Science Daily December 18, 2023

The University of Exeter study has been published in *The Journal of Nutrition* and is the first of its kind to demonstrate that the ingestion of two of the most commonly available algal species are rich in protein which supports muscle remodelling in young healthy adults.

Their findings suggest that algae may be an interesting and sustainable alternative to animal-derived protein with respect to maintaining and building muscle.

Foods rich in protein and essential amino acids have the capacity to stimulate muscle protein synthesis, which can be measured in the laboratory by determining the incorporation of labelled amino acids into muscle tissue proteins and translated to a rate over time. Animal-derived protein sources robustly stimulate resting and post-

exercise muscle protein synthesis.

Cultivated under controlled conditions, spirulina and chlorella are algae that contain high doses of micronutrients and are rich in protein. However, the capacity of spirulina and chlorella to stimulate myofibrillar protein synthesis in humans remains unknown.

University of Exeter researchers assessed the impact of ingesting spirulina and chlorella, compared with an established high-quality nonanimal-derived dietary protein source (fungal-derived mycoprotein) on blood amino acid concentrations, as well as resting and post-exercise myofibrillar protein synthesis rates. Thirty-six healthy young adults participated in a randomized, double-blind trial.

Following a bout of one-legged resistance leg exercise, participants ingested a drink containing 25 grams of protein from fungal-derived mycoprotein, spirulina or chlorella. Blood and skeletal muscle samples were collected at baseline and during a four-hour post-feeding and post-exercise period. Blood

amino acid concentrations and myofibrillar protein synthesis rates in rested and exercised tissue were assessed. Protein ingestion increased blood amino acid concentrations, but most rapidly and with higher peak responses following consumption of spirulina compared with mycoprotein and chlorella.

Protein ingestion increased myofibrillar protein synthesis rates in both rested and exercised tissue, with no differences between groups, but with higher rates in exercised compared with rested muscle.

## Innovations in dairy proteins: How industry is evolving to meet holistic health and functional nutrition needs

07 Dec 2023 Nutrition Insight

The dairy protein market continually evolves as the ingredients expand beyond the sports nutrition space.



Currently, dairy proteins are trending as sought-after ingredients in the holistic health, gut health and functional and fortifying ingredients categories.

Moreover, technology for traditional dairy proteins, often used in the sports nutrition arena, are creating solutions that offer greater nutritional value while ramping up texture, flavour and ingredient combinations.

Innova Market Insights data suggests that supplement and sports nutrition launches with dairy-based proteins grew 13% year-over-year at a growth rate from July 2021 to June 2023. Additionally, it suggests that over half of the launches were sports powders, with whey protein isolate being the leading ingredient and casein positioned as the lead dairy protein for innovation.

“While once a niche category dominated by protein shakes for the most dedicated fitness enthusiasts, dairy proteins have been reinvented in consumers’ eyes as a cornerstone for good holistic health,” Vicky Davies, FrieslandCampina Ingredients reveals. “More consumers focusing on full body and mind wellness inevitably influences the development of new dairy protein offerings. This is perhaps best exemplified in the ‘protein plus trend,’ where consumers want protein products that offer multiple health benefits like gut health or energy management.” She notes that the company’s latest innovation, Biotis Fermentis, fuses whey protein with prebiotics and probiotics.

The innovative blend is designed to enhance athletic performance and overall health by focusing on the gut-muscle axis.

Dr Shakti Singh, Fonterra, agrees, emphasizing how consumers increasingly perceive health in a holistic way. “We have moved beyond needing to just convince consumers that well-being and nutrition are important,” Singh explains. “It is now about providing tailored solutions that harmonize the brain and body to the right consumers.” Singh further notes that the company is looking at three main trends influencing dairy protein development – functional nutrition, whole foods and personalization. At the same time, Dr Singh at Fonterra stresses that dairy protein innovation should integrate diverse consumer lifestyles, motivations and obstacles to create tailored solutions and foster stronger connections with consumers. “Protein consumption and the clinically proven health benefits of protein drives the need for more efficient delivery of protein or more protein per serving,” he underscores. “Taste and texture expectations also must be met for repeat purchase, especially for mainstream consumers.”

Michael Natale, Ingredion, notes that plant-based analogs to dairy proteins are also on trend, and top dairy industry players are noticing. “Major dairy manufacturers are starting to play into the plant-based dairy market and they have the scale to bring more innovation to the consumer



base and continue to invest in ingredient innovation that serves both markets and critically delivers value to both customers and consumers,” he explains. Furthermore, he says that creating plant-based milk, yogurt, cheese and similar products requires expertise in both ingredients and processing techniques. “When it comes to food trends from a generation perspective, According to ATLAS, Ingredion proprietary research, purchase of dairy alternatives is higher among younger consumers,” he reveals. “34% of consumers 18-34 year olds are buying more dairy alternatives in 2023 versus 2020 compared to 22% of 50-74 year old consumers.”  
By William Bradford Nichols

### CRN-I report advocates supplementation of choline, NAD and xanthophyll carotenoids to increase global health

04 Dec 2023 Nutrition Insight

A new US Council for Responsible Nutrition-International (CRN-I) conference report points to three key nutrient





being by interacting with folate and vitamin B12 and lowering the plasma homocysteine levels in the blood. It further helps the liver and muscles synthesize

phosphatidylethanolamine, an essential component of cell membranes and blood lipoprotein particles. Choline added to the diet of pregnant women has been detected in the liver of the fetus. The concentration of choline found in the cord blood and breast milk also confirms that fetuses and infants receive choline from their mothers.

The report further points to the need for dietary modification, including appropriate nutrient supplementation, to prevent increasingly problematic and widespread neurodegenerative diseases. Compounds that help increase NAD levels show promise. Cellular NAD declines with age, and increasing NAD replenishment through supplements is beneficial, according to the report. NAD-replenishment targets multiple processes associated with neurodegenerative diseases, such as impaired mitochondrial metabolism, bioenergetics, somatic DNA damage, dysregulated epigenomics and declining lysosomal and neuroinflammation. Through these properties, NAD potentially increases neuronal resilience and protects neurons from disease-associated stress.

NAD can be supplemented via the intake of vitamin B3 forms such as nicotinic acid,

nicotinamide and nicotinamide riboside. A recent study found that the daily oral intake of 1000 mg nicotinamide riboside significantly increased NAD levels in the human brain.

The xanthophyll carotenoids macronutrients are highlighted for their bioavailability and health-enhancing and disease-modifying properties. They can only be consumed through diet and are especially beneficial to visual performance and cognitive function. Research highlights a potential for their use in diagnosing and managing chronic and age-related diseases. Xanthophyll carotenoids are among a diverse group of carotenoids naturally found in various fruits and vegetables, which stand out due to their unique chemical structure and potential biological activities.

By Milana Nikolova

## How can food, beverage companies better harness AI? Focus on the human element

By Ryan Daily 15-Nov-2023 - Food Navigator USA

"AI is a great additional tool. ... We view it as almost this new opportunity to be able to utilize the current datasets, new frameworks — being able to analyse — but it doesn't take away the need for a



categories with the potential to make a difference globally — choline, nicotinamide adenine dinucleotide (NAD) and xanthophyll carotenoids.

The report offers an overview of health challenges and policy recommendations to address the expanding gaps in nutrition and the subsequent health challenges, emphasizing the importance of personal nutrition. "Developing science demonstrates that choline, NAD replenishment and xanthophyll carotenoids are helpful in preventing certain health problems," says Dr James Griffiths, co-author and senior vice president of international and scientific affairs at CRN-I. "Choline, for example, helps reduce issues with the brain and spinal cord in babies, NAD-replenishment can protect your brain against neurodegenerative diseases and xanthophyll carotenoids help prevent the deterioration of eye and brain health."

The report is published in the European Journal of Nutrition and covers the proceedings of CRN-I's Scientific Symposium in Düsseldorf, Germany.

Choline is not naturally synthesized by the body, yet it is vital to the health of adults and growing infants and children alike. The chemical compound facilitates well-



human to access it, to understand the questions that are being asked in the right way, and to frame conversations. So, we look at it just an additional tool, a great tool, but needing that human connection and the framework to be able to ... unlock it in the ways that are most helpful," said Emily Gee, marketing director at Aero Farms.

Companies deploying AI in their organization should focus less on the hype and what problem they are looking to solve for the consumers, said Stephanie Retcho, CMO at Hungryroot.



"We're using technology to solve a burdensome problem for customers,

and I think that's the key. In terms of things to watch out for when you're leveraging AI. What question are you trying to answer? What problem are you actually trying to solve?" she said. "I think that in our space, there's a little bit of chasing what's shiny and not really spending the right amount of time figuring out what problem you're trying to solve."

CPG companies can solve a range of problems with AI and use it to gain insight into how to improve their sales process, better market to consumers, and more, the panellists shared. Recently, Aero farms used its AI platform to better understand how its customers were using its Micro greens products and used that

information to create a better website to explain the benefits of the products, Gee said. "AI has helped to also understand our consumer better so that we can then create a more targeted experience on our website. It's a great way for them also being able to have SEO and digital optimization that's then aligned with those target audiences. But again, always making sure that there is a person and that ... checks-and-balances system."

While AI can drive efficiency, the technology shouldn't replace humans in making business decisions, noted Mir Ali, head of digital engineering at Kraft Heinz Company. "At the end of the day, this is a technology, and there's room for error. So, we need to make sure this does not overtake human capabilities," Ali said. "At the end of the day, human needs to be in the loop to actually make that trigger ... so it's not accurate. It's not 100%, and it's not going to replace anybody."

Though AI might not replace humans, organizations might need to shift roles and responsibility around to better capitalize on the technology, Retcho noted. "To those who think that [AI is] about losing jobs or a threat to jobs, I think it might shift responsibilities, but I think that the notion that there's a complete replacement there is a little bit of a misnomer... There's going to need to be human intervention to guide, to create the framework that you apply with AI, and that probably just shifts a little bit where you put roles and responsibilities."

### Innovation challenge: How can firms meet reformulation and fortification demands while remaining cost competitive?

By Pearly Neo 31-Oct-2023 - Food Navigator Asia

Consumer demand for product premiumisation at more affordable prices has skyrocketed over the past year, and with inflationary hikes and logistic costs also on the rise, firms can struggle to remain competitive.

"Many brands want to reformulate or fortify their products to add value to these, but face the challenge of doing this whilst maintaining final product costs that they know are acceptable to consumers as it can be daunting to know what and how to change," IMCD APAC Market Segment Director and Regional Technical Manager Food & Nutrition Koh Wanlin told FoodNavigator-Asia.

"There are actually multiple factors that can be considered when it comes to implementing more efficient and effective reformulation, such as the origin of



concern because of both the health connotations and that the prices tend to fluctuate a lot," Koh said. "Then there is also butter, which usually is more in the spotlight as a result of having very premium pricing and

ingredients - for Asian food firms, it would make sense to focus on sourcing raw materials from nearer sources to cutdown on shipping costs and possibly even add value by varying the types of ingredients available. There are also hikes resulting from specific items - for example eggs in Singapore, which recently saw an immense rise in pricing especially when its main source Malaysia banned exports across the border.

"Knowing that this is the main issue causing price increases, bakery companies for example can actually focus on that one item, to remove eggs from their formulations and substitute this with alternatives such as whey protein that can still give the rise needed. The key thing is to identify the main area of concern and address it accordingly with alternatives that can increase product efficiency and value whilst maintaining or improving quality or functionality such that consumers can see and appreciate these, in order to increase desirability."

She added that the same approaches can also be applied to product reformulation to reduce sugar and fat content. "Sugar is also often an area of

a specific buttery flavour that is difficult to mimic - but today, there are enzymatic processes that are able to bring this into products. Looking at these, we do foresee that ingredient costing concerns will continue to be a focus into 2024, which in turn means that affordability will continue to be top-of-mind for consumers in APAC, so food firms are really going to need to continue to innovate with this as a top priority."

### Improve consumer acceptance by mapping out the time-based in-mouth experience

By Gill Hyslop 01-Dec-2023 - Food Navigator USA

A snack's success or failure ultimately depends on what consumers think of it, so it's essential to understand their response in detail.

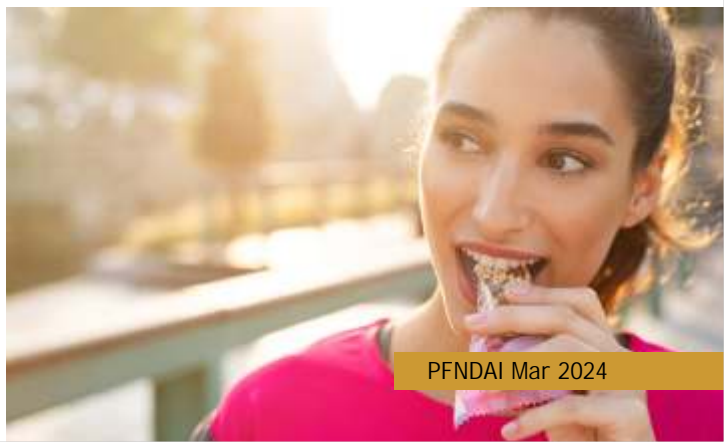
Whether embarking on product innovation or an optimisation programme, all brand developers need a helping hand. The consumer can be tricky customers, especially when it comes to the 'perceived' characteristics of a product that make it

stand out. Doubts will undoubtedly crop up. Such as, does the competitor product have a more desirable initial 'bite'? Or upfront burst of flavour? Is the texture positively received throughout the entire eating experience? Is there an aftertaste that consumers don't like?

To answer these questions in enough detail to successfully develop a new product or optimise an already developed range, you may need to consider using time-based sensory mapping.

According to Marleen Chambault, sensory and consumer research scientist for Campden BRI, time-based sensory mapping is a consumer guide to the key characterisations that are instrumental in conquering your market.

"Time-based sensory mapping with consumers is a really useful way to characterise - in detail - the in-mouth consumer perceptions of your products during the whole eating and drinking experience," said Chambault. "It can be used with consumers to evaluate both food and drink products to help technical, new product development (NPD) and marketing teams understand their products better."







She explained the technical method used for time-based sensory mapping is temporal check-all-that-apply (TCATA), with 'temporal' being the key word, as this method looks at the timing of the various elements of the consumer in-mouth experience. "The temporal check-all-that-apply method allows you to determine when the different sensations are delivered by your product, and how the consumer experience changes throughout the eating and drinking experience," said Chambault.

Consumers select and unselect the attributes they perceive from the moment they take a first bite or sip to the moment they swallow and beyond, thereby capturing flavour, after taste and mouthfeel. This builds up a time-based sensory map, which characterises the product and provides a really useful depth of valuable information. After the TCATA task, consumers also indicate how much they like the samples, as well as show how likely they would be to purchase them. "This then determines what temporal sensory characteristics drive consumer liking."

So, what projects will benefit from time-based sensory mapping with consumers?

"Time-based sensory mapping provides you with the complete in-mouth experience of your product, including the evolution of sensory characteristics over time and how these interact with one another," said Chambault. "This makes it an excellent tool to guide product development by understanding and improving how a new product delivers the different in-mouth sensory characteristics."

### Future Ocean Foods "tells a new story for alternative seafood"

By Deniz Ataman 04-Dec-2023 - Food Navigator USA

The recently launched association Future Ocean Foods is changing the narrative for alternative seafood through industry and consumer education and partnerships, including with traditional seafood, to reflect the category's nutritious, sustainable, equitable and ethical pursuits, according to Founder and Executive Director Marissa Bronfman.

With its recent launch in November, alternative seafood association, Future Ocean Foods (FOF), includes 36 companies in 14 countries from start-ups to established companies with products in market and across plant-based, fermentation and cultivated food and technology sectors.

As the organization ramps up its efforts to educate consumers and supply chain stakeholders on the benefits of alternative seafood, Bronfman said that the term "alternative" needs to be fresh.

"We all strongly feel that we need to tell a new story for alternative seafood," including reworking the term "alternative," which Bronfman cites as a stigmatized term for consumers who feel alternative foods are fake or made with unnatural ingredients. "So even the word 'alternative,' whether alternative proteins or alternative seafood, is really problematic. There's not a lot of consensus, there's not a broad understanding. So we all feel that at Future Ocean Foods, it's up to us to define and create a new language with which we can talk about what we'll call alternative seafood," she emphasized. She added, "A large part of what we're doing is creating something that's hugely nutritious, delicious, sustainable and also happens to be ethical and equitable."

While consumers seek seafood for a healthy, protein-rich diet, Bronfman noted that the same omega-3s in fish can be derived from algae, which is a sustainable food source according to a 2022 Frontiers study.





“When we think about fish omegas, that’s typically why we consider fish to be healthy and unique. But fish eat algae to get their omega and humans can eat algae to get omegas. So there’s also a really big part of ‘let’s go back to basics,’” she said.

FOF’s work with omega-3 production is leveraged through its partnership with The Global Organization for EPA and DHA Omega-3s (GOED), which represents the worldwide eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) industry; as well as a number of FOF members that produce fish-free omega-3 derived from algae: Mara Renewables, infusd nutrition and Algorithm. Expanding education and partnerships may improve access to funding within the category

While funding in the alternative protein space has largely gone to alternative meat, Bronfman says she is hopeful that despite the smaller size of the seafood market, investors will find a “huge opportunity globally” to invest in the sector. Along with expanding education and awareness of the health and sustainability opportunities for

consumers, FOF intends to reach investors on a similar level.

### Taste perception of ultra-processed foods no better than less processed

By William Dodds 27-Nov-2023  
- NutraIngredients

New research which compared the taste perception of less processed foods with ultra-processed foods (UPFs), found that participants viewed UPFs no more favourably.

The research was conducted by the University of Bristol’s Nutrition and Behaviour Group and has been published in the journal *Appetite*. It supports the theory that humans are programmed to learn to like foods with more equal amounts of carbohydrate and fat. Researchers wanted to test the largely untested assumptions that food energy density (calories per gram), level of processing and carbohydrate-to-fat ratio are key factors influencing how much people like a food and desire it. For the experiment, which involved 224 adult volunteers, participants were presented with colour images of between 24 and 32 familiar foods, which varied in energy density, level of processing and carbohydrate-to-fat ratio. There were 52 different foods in total, including avocado,

grapes, cashew nuts, king prawns, olives, blueberry muffin, crispbread, pepperoni sausage and ice cream.

The participants then had to rate the food in order of pleasantness, desire to eat, sweetness and saltiness. The results found that on average UPFs were not seen as more pleasant or desirable than processed or unprocessed foods. However, foods that combined more equal amounts of carbohydrate and fat, were more liked and desired than foods containing the same number of calories mostly as carbohydrate, or mostly as fat.

Professor Peter Rogers, the study’s lead author, said: “Our results challenge the assumption that ultra-processed foods are hyperpalatable, and it seems odd that this has not been directly tested before. “However, whilst ultra-processing didn’t reliably predict liking (palatability) in our study, food carbohydrate-to-fat ratio, food fibre content, and taste intensity did - actually, together, these three characteristics accounted for more than half of the variability in liking across the foods we tested. The results for sweetness and saltiness, are consistent with our innate liking for sweetness and saltiness. And the results for carbohydrate-to-fat ratio and fibre might be related to another important characteristic that determines food liking.



# REGULATORY NEWS

## Changing the narrative: How “healthy” and “sustainable” labels could boost plant-based choices

19 Dec 2023 Nutrition Insight

US-based researchers suggest that changing food labels from “vegan” or “plant-based” to “healthy” or “sustainable” may encourage people to eat more meals without dairy and meat. They note that the word “vegan” has negative connotations, but people are increasingly concerned about eating healthy and environmentally friendly food.

In an online study, US citizens were twice as likely to choose a gourmet gift basket without meat or dairy if it was labelled as “healthy” or “sustainable” than if the products were labelled as “vegan” or “plant-based.”

**Nutrition Insight** discusses the study’s outcomes with its authors Patrycja Sleboda, assistant professor of psychology at the City University of New York, Wändi Bruine De Bruin, co-director of the behavioural sciences program at the University of Southern California and Joe Arvai, director of the University of Southern California’s Dornsife Wrigley Institute for environmental

studies.

“We hope that food products currently labelled as ‘vegan’ or ‘plant-based’ will be re-labelled as healthy to shift people’s focus and boost healthier and more sustainable consumption,” underscore the authors.

“The label ‘vegan’ is very unpopular among US citizens and Europeans, and the label ‘plant-based’ is not much more popular. Many people don’t realize that vegan or plant-based diets are healthier and more sustainable.”

The researchers indicate that meat and dairy have a significant carbon footprint, contributing over 70% of global food-related greenhouse gas emissions. In addition, various studies have linked limiting animal-based products and increasing fruit and vegetable intake to lower disease risks and better weight management.

In the study published in The Journal of Environmental Psychology, 7,341 participants chose between a vegan gourmet gift basket and one that contained meat and cheese. When making the choice, the vegan basket was randomly labelled as “vegan,” “plant-based,” “healthy,” “sustainable” or “healthy and sustainable.”

The plant-based label scored

slightly better than the vegan label, with 27% and 20% of participants, respectively, selecting those baskets. However, when the same basket was labelled as healthy and sustainable, 44% of study participants opted for the products. When it was labelled as sustainable, 43% of participants chose the vegan basket, compared to 42% when labelled as healthy.

By Jolanda van Hal

## Govt plans to do away with multiple certifications for food products; only FSSAI nod mandatory

Economic Times Feb 6, 2024

The Indian government has approved amendments to food safety and standard regulations, requiring only one certification from food regulator FSSAI for food products.

The Food Safety and Standards Authority of India (FSSAI) will





animal source counterparts (think 'vegan burger', 'plant-based sausage', or 'dairy-free cream') has been hotly debated in recent years.

issue a draft notification and seek stakeholders' comments before finalizing the amendments. The move aims to facilitate ease of doing business through the concept of 'One Nation, One Commodity, One Regulator'.

For food products, certifications from the Bureau of Indian Standards (BIS) and AGMARK will not be needed if these amendments are finalised. In a statement, the Health Ministry said the FSSAI in its 43rd meeting approved various amendments to streamline food safety and standards regulations.

The meeting was held under the chairmanship of Union Health Secretary Apurva Chandra. "Various amendments across different food safety and standards regulations were approved in the meeting to do away with Bureau of Indian Standards (BIS) or AGMARK certification for food products," the statement said.

## 'It's time to legislate': EU seafood sector crabby about plant-based 'fishy' labelling

By Flora Southey 04-Dec-2023  
- Food Navigator USA

Whether plant-based meat and dairy alternatives should use terminology linked to their

In some jurisdictions, specific terminology is now banned for plant-based products. Europe's dairy-free market is case-in-point, where you'll no longer find 'milk', 'butter', 'cheese' and 'yoghurt' for sale in the plant-based aisle.

Meat and dairy alternatives have attracted most of the labelling attention to date, whereas seafood alternatives - which take a smaller share of both plant-based and seafood markets - have largely been off the hook.

But in Brussels last week, the labelling of vegetarian and vegan imitations of fish products was absolutely on the menu: the seafood sector wants tighter regulations for plant-based products.

On 29 November, the Committee on Fisheries (PECH) held a public hearing to address the regulatory framework surrounding the labelling of plant-based

substitutes of fish products and its impacts on the fisheries sector. As it stands, seafood alternatives can be marketed with 'fishy' terminology, such as 'plant-based salmon' and 'vegetarian fish sticks'.

According to PECH, an inadequate regulatory framework risks harming the fisheries sector by misdirecting consumer choices, undermining fair competition, and 'eroding trust' in the authenticity of seafood products.

Article 7 of Regulation 1169/2011 states that food information must not mislead and food information must be precise, clear and easily understandable for the consumer. But plant-based seafood alternatives are misleading consumers, argued Claudia Benassi, marine biologist for Coldiretti Impresapesca National Confederation, who is calling for transparency labelling against seafood fraud.

"Fish products are currently the subject of numerous frauds and imitations by plant-based products which confuse consumers and which risk compromising the competitiveness of the sector.



There are even reverse frauds, i.e., non-vegan products passed off as such." Increasing the transparency of plant-based products would protect seafood producers, who are amongst the most at risk to fraud - 'both from a health and commercial point of view'.

France is mulling a ban on 'meaty' names for plant-based products. South Africa has also banned 'meaty' denominations being used on vegan products, and Turkish legislation now states the term 'cheese' cannot be used to describe dairy-free alternatives. Last year, the Turkish government also banned the production of vegan cheese alternatives.

At an EU level, the European Court of Justice implemented a ban on the use of dairy names such as 'milk', 'butter',



'cheese', and 'yoghurt' for purely plant-based products (with the exception of coconut milk, peanut butter, almond milk and ice cream) back in 2017. Three years later, the European Parliament voted against a ban on 'meaty' terminology for plant-based alternatives such as 'burger', 'sausage' or 'steak'. Another reason consumers may

be misled by the 'fishy' marketing of plant-based market comes down to nutrition, according to seafood stakeholders.

From a nutritional point of view, fish and seafood products do not have alternatives or replacements, stressed Yobana Bermúdez, president of the European Federation of National Organisations of Importers and Exporters of Fish (CEP) and chair of the Market Advisory Council (MAC). But according to recent findings from Nielsen IQ and the Food Industry Association, close to one-third (31%) of consumers in the US purchase seafood alternatives because they believe them to be more nutritious or healthier.

For the CEP president, consumers are confused about the difference between plant-based diets and plant-based products. Although the term 'plant-based' is not clearly defined, it does not necessarily mean cutting out meat, poultry, seafood, eggs and dairy from diets, but rather eating more foods from plants and less from animals, he explained.

What it does not mean is consuming processed plant-based products instead of conventional alternatives. It has not been proved that processed plant-based products are healthy, he continued, and are not recommended in 'any diet'. "A plant-based product is not the



same as a plant-based diet."

But it's not all about processing. The nutritional credentials of plant-based meat, dairy, and seafood have come under fire for excessive salt and fat content, as well as their often long and confusing ingredients lists. Tuna is rich in omega 3, vitamins B3 and B12, and contains minerals such as selenium, phosphorus and zinc. Ingredients on a can of brined tuna are likely to include tuna, water, salt and natural flavours.

Garden Gourmet's 'Vuna' is one such product to have been criticised by the secretary general of the Spanish association of canned fish manufacturers, Baptista de Sousa. From a terminology perspective, the product claims it 'tastes like tuna' and contains 'no fish'.

The product's textural appearance is suggestive of tuna, and its packaging (in a glass twist-top jar) is similar to that of other tuna products. It evokes canned tuna, stressed the secretary general. "For fish, it is not improving sustainable diets, nor reducing carbon footprint, or improving diets at all. It is only creating a market to grow and sell a new product...taking advantage of fishery products."



fermentation technology using *Bacillus subtilis* subsp. Natto isolated in Chungjukjang - a Korean traditional fermented soybean paste.

"We succeeded in manufacturing vitamin K2 with our own technology developed domestically, but it was unfortunate that it could not be used in domestic health functional foods," he said.

But Rafael Pinto, policy manager for the European Vegetarian Union (EVU), could not disagree more. Garden Gourmet's Vuna product indicates it is not tuna numerous ways: it carries the V-Label (designated for vegan products), says it is 'made with plant-based ingredients', notes it is 'pea protein based', and twice states 'no fish' and 'tastes like tuna'. All up, Pinto stresses Garden Gourmet has indicated eight times the product is plant-based, and therefore not made from tuna.

This is followed by supercritical extraction, crystallisation, and microencapsulation of the ingredient, as vitamin K2 could be easily degraded when in contact with alkali salts, such as calcium and magnesium, which are also commonly used in health functional foods.



The company said that its ingredient, marketed as MediQ7 Vitamin K2 (MK-7), could improve bone and cardiovascular health, as well as preventing osteoporosis by inhibiting the accumulation of calcium in blood vessels.

Currently, only vitamins, minerals, dietary fibre, protein in the notified health functional food ingredient list, as well as ingredients listed in the Food or Food Additives code could be used in health functional food. According to the Health Functional Food Code 2021, there are 28 nutrients and 68 functional ingredients that could be used to manufacture health functional foods.

## Vitamin K2 to be approved as a health functional food ingredient in South Korea by March 2024

By Tingmin Koe 05-Dec-2023 - Food Navigator Asia

The development comes as the health functional food industry has proposed to do so, against the backdrop of vitamin K2's wide applications in health supplements overseas.

As part of the ministry's efforts in understanding vitamin K2's use, minister Oh Yu-Kyoung visited the production site of local vitamin K2 manufacturer, GF-Fermentech, on November 15. GF-Fermentech produces vitamin K2 through a

Han Jeong Jun, CEO of GF Fermentech, said during minister Oh's visit that his company has been manufacturing vitamin K2 for the export markets and hoped that the ingredient could be used in the domestic market.



However, vitamin K2 is not part of the list, although the MFDS had announced in September that it planned to establish new specifications and usage standards for vitamin K2 as a nutritional fortifier in health functional foods.

## Processing tech can boost food, but can transparency close the trust gap?

By Deniz Ataman 21-Dec-2023  
- Food Navigator USA

According to IFT, food processing can be defined “as the use of methods and techniques involving equipment, energy and tools to transform agricultural products, such as grains, meats, vegetables, fruits, and milk into food ingredients or products.

Rosales emphasizes more emerging technologies like fermentation and precision fermentation as sustainable solutions that address the nutritious needs of a growing population.



“Fermentation is this beautiful kind of ancient knowledge that we’ve been able to modernize to potentially improve the nutritional bioavailability of foods. There are several different mechanisms that fermentation can do this through whether that’s from altering the food matrix to enhance the macro nutrient digestibility and micronutrient’s availability, or ...increase protein digestibility ... by degrading complex proteins and breaking it down into smaller peptides and amino acids ... and help

improve starch digestibility by activating the starch hydrolysing enzymes,” she explained.

Precision fermentation, she added, is a modernized solution from the “ancient knowledge that we have,” to help develop plant-based proteins and address sustainability challenges, while providing more protein supply that aligns with population demands. The paper also discussed the role of preservation techniques like cooling, dehydration and heating, as sustainable methods to strengthen food safety and nutrition security.

“The primary goal of preservation is first and foremost food safety, maintaining the quantity and quality of the food from production to consumption without compromising safety, the taste or the nutrition,” Rosales explained.

“We really cover a full range of these technologies and opportunities within the paper itself, highlighting both the existing as well as emerging technologies in this space, as well as looking at the developing nation perspectives.”

From a consumer perspective, misunderstanding around the term “processed” can certainly hinder growth around improving food availability in the future. While fermentation is more readily understood through common food products like cheese, yogurt and beer, Rosales said that “radical transparency” is critical to



improve understanding around food processing.

“We need to be really clear, we need to not just use terms that are wholly scientifically understood, but that are understandable to a consumer. So, translating some of these technologies into terms that ... my mom could understand who doesn’t have a scientific background, it’s really essential to help people understand and to have confidence in what they’re eating.”

## Palm oil trade war? South East Asia gears up to fight back against EU deforestation regulation

By Pearly Neo 30-Jan-2023 - Food Navigator Asia

The European Union (EU) parliament approved its long-debated deforestation regulation last year, and has not budged on its position despite long-time opposition from many producer countries worldwide, especially palm oil producing nations such as Malaysia and Indonesia in the ASEAN region.





Previously the two palm oil heavyweights had been less consistent in their approach opposing the deforestation regulation, but given the recent developments as well as Malaysia's change of government, much stronger co-operation appears to be on the cards.

Most prominently, the governments of both nations have recently mentioned considering simply cutting off palm oil trade with the EU, given its strong negativity to the commodity.

"One option will be to stop exporting to Europe, and focus on other countries, if they keep making it difficult for us," Malaysian Minister of Plantation and Commodities and Deputy Prime Minister Datuk Seri Fadillah Yusof told the floor at a recent palm oil event.

"Palm oil is considered the cheapest available oil, and the

EU's constantly changing goalposts are giving the impression of being a trade barrier to protect their products. This is where the World Trade Organization should have to come

in to make sure such unfair trade restrictions could be removed."

This sentiment was echoed by Indonesian Coordinating Minister for the Economy Airlangga Hartarto at a local press conference.

"The EU is being ambivalent and showing two attitudes when it comes to palm oil - they're trying to make things difficult in trade for it, but when Indonesia stopped palm oil exports, they also had complaints as they need this commodity," he said.

"Indonesia probably should not have anything to do with palm oil trading with the EU."

Industry experts say that the negative emotions ASEAN nations are feeling with regard to the entire issue are clear to see, with this issue having been a core point of contention in the trade relations between both regions

over the past few years.

"Southeast Asian anger and frustration towards Brussels is growing," palm oil industry expert Khalil Hegarty told FoodNavigator-Asia.

"And amidst all of this, further trade disruptions to exports from Malaysia and Indonesia could prove detrimental to EU businesses and consumers with vegetable oil prices still high including sunflower oil due to the Russia-Ukraine conflict. This is driving up food prices and adding to inflation levels and even European companies that have had 'no palm oil' marketing strategies have had to switch to palm. Import restrictions like the Deforestation Regulation and any additional export restrictions from ASEAN mean European businesses will struggle keep costs down and consumers face price hikes."

Indeed, if palm oil exports to the EU end up being halted completely in retaliation, the most likely group to suffer will be EU consumers as it is apparent that the region - and indeed the rest of the world - has yet to find a suitable alternative vegetable oil especially when considered in the context of industrial food applications.

