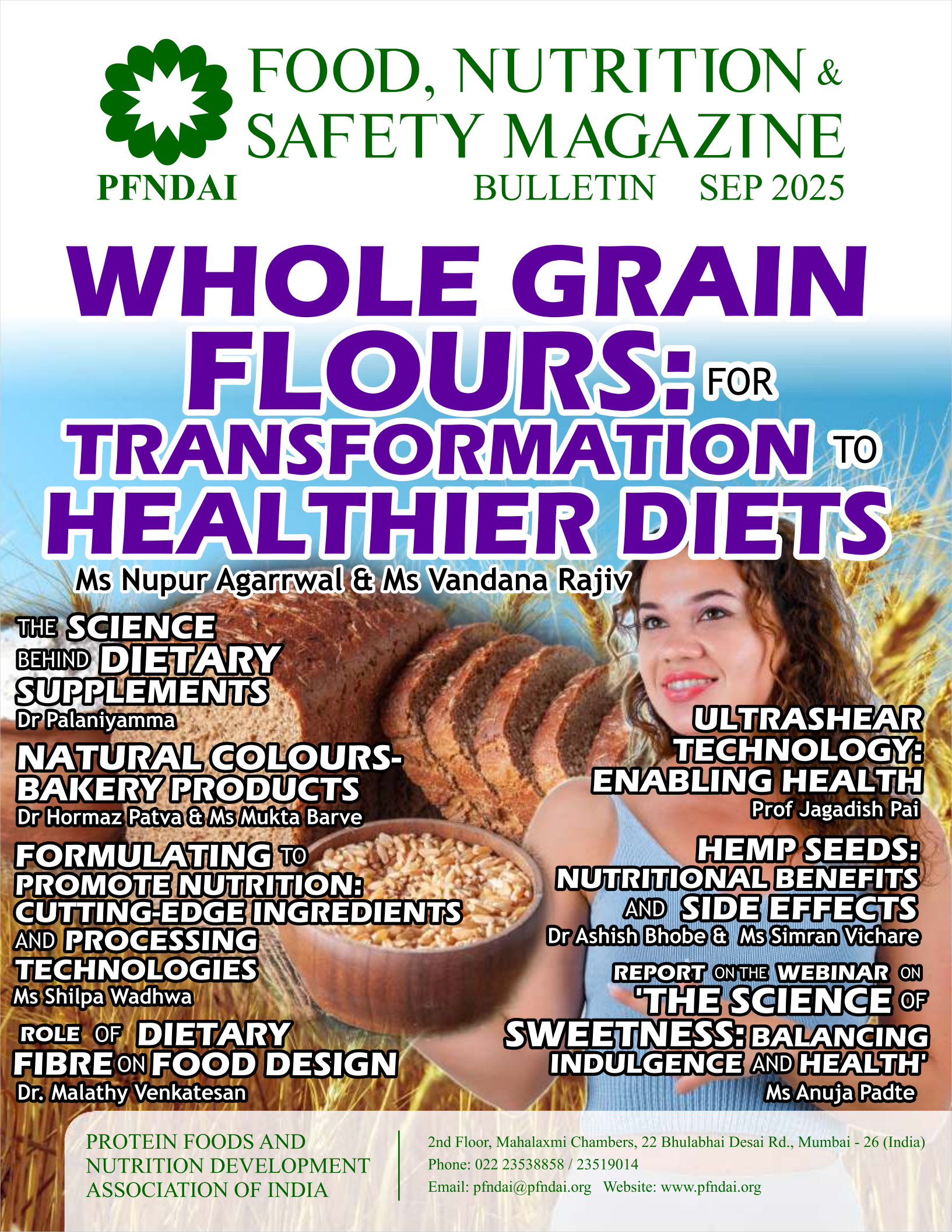
PFNDAI

FOOD, NUTRITION & SAFETY MAGAZINE

BULLETIN SEP 2025

WHOLE GRAIN FLOURS: FOR TRANSFORMATION TO HEALTHIER DIETS

Ms Nupur Agarrwal & Ms Vandana Rajiv



THE SCIENCE BEHIND DIETARY SUPPLEMENTS
Dr Palaniyamma

NATURAL COLOURS- BAKERY PRODUCTS
Dr Hormaz Patva & Ms Mukta Barve

FORMULATING TO PROMOTE NUTRITION: CUTTING-EDGE INGREDIENTS AND PROCESSING TECHNOLOGIES
Ms Shilpa Wadhwa

ROLE OF DIETARY FIBRE ON FOOD DESIGN
Dr. Malathy Venkatesan

ULTRASHEAR TECHNOLOGY: ENABLING HEALTH
Prof Jagadish Pai

HEMP SEEDS: NUTRITIONAL BENEFITS AND SIDE EFFECTS
Dr Ashish Bhobe & Ms Simran Vichare

REPORT ON THE WEBINAR ON 'THE SCIENCE OF SWEETNESS: BALANCING INDULGENCE AND HEALTH'
Ms Anuja Padte

PROTEIN FOODS AND NUTRITION DEVELOPMENT ASSOCIATION OF INDIA

2nd Floor, Mahalaxmi Chambers, 22 Bhulabhai Desai Rd., Mumbai - 26 (India)
Phone: 022 23538858 / 23519014
Email: pfndai@pfndai.org Website: www.pfndai.org

Finamul 4087L: Functional Emulsifier System for Cookies

FINE ORGANICS

Cookies are the most sought-after snack in India. However due to its higher fat content (+20%) consumer trend is more toward low fat options. Hence, manufacturers are finding ways to reduce the fat content without affecting textural & sensorial attributes.

Fine Organic's functional emulsifier system Finamul 4087L enables manufacturers to reduce fat by 7-10% in cookies.

Control	T1	T2

Excellent texture, richness and mouth-feel at lower fat content have been observed while using Finamul 4087L

Parameters	Control	T1	T2
Fat (%)	100	100	**90**
Emulsifier		Lecithin (322)	**Finamul 4087L**
Cream density	0.618	0.569	**0.557**
Avg. height of 10 biscuits (cm)	8.4	9.4	**9.5**
Avg. Weight of 10 biscuits (g)	111.2	111.5	**114**
Avg. Diameter (cm)	5.6	5.5	**5.5**
Spread ratio	0.66	0.56	**0.58**
Bite	Slight hard	slight crispy/soft	**Soft/crispy**

10% lower fat with excellent textural properties

Advantages of Finamul 4087L :

- Increased stack height
- Less crumbly
- Improves surface texture
- Improved machinability
- Controls cookie spread
- Maintain texture over shelf life

Major applications

- Short Dough Biscuits
- Cookies
- Crackers
- Multigrain Biscuits

Select a befitting specialty food ingredient for your food formulation with us at: food@fineorganics.com.

We look forward to connecting with you and can host technical webinars to specially address your requirements.

Disclaimer: Information given herein is in good faith but without guarantee since the conditions of use of the product are not in our control. Fine Organic Industries Ltd & it's associate companies expressly disclaims any responsibility for the suitability of the products for any specific or particular purposes by the user and does not assume any liability or risk involved in the use of its products. We recommend that the actual user make tests to determine the suitability of a product for their particular application prior to use. User should refer to SDS and other relevant data for safe handling. The user of the products is solely responsible for compliance with all laws and regulations applying to the use of the products, including intellectual property rights of third parties.

Tel: +91 (22) 2102 5000 Extn. 100 | Email: info@fineorganics.com I Web: www.fineorganics.com

FIL
Flavours

taste stimulate the secretion of digestive juices
this pleasant experience provide mouth watering...
indication of enjoyment of food

taste is a valued concept in food..... creating consumer appeal
through taste is our speciality

We work intimately with the nature in creating unique, innovative functional flavour systems that excite the palate - taste and create new sensations to all processed foods and beverages that goes a long way in market success and creating brand value.....

FOOD INGREDIENT SPECIALITIES PRIVATE LIMITED
No. 90, Vanagaram - Ambattur Road, Ayanambakkam,
Chennai - 600 095. India

FIL
Flavours

Tel : 044 - 26531336 / 2653 0572 / 2653 0451 / 2653 0452
email : info@foodingredientspecialities.com / foodinfil@gmail.com

THE POWER OF PLANT PROTEIN

At IFF, purposeful nutrition begins at the source.

SOLAE® SUPRO® soy protein is more than just an ingredient—it's a symbol of innovation, trust, and performance.

Backed by decades of scientific expertise and sourced from identity-preserved U.S soybeans, it delivers complete, high-quality protein—sustainably and responsibly.

It's the future of nutrition—powered by nature, perfected by science.

SOLAE®, part of the IFF family.

Learn more

©2025 International Flavors & Fragrances Inc. IFF is a Registered Trademark.

Circulated to PFNDAI Members Only
PFNDAI is not responsible for the authenticity and correctness of the information published and the views expressed by the authors of the articles.
Email : pfndai@pfndai.org Website : www.pfndai.org

PFNDAI Bulletin SEP 2025
FOOD, NUTRITION & SAFETY MAGAZINE
Editor: Dr. J. S. Pai

EDITORIAL BOARD
Dr. J. Lewis
Ms. Shipra Sehgal
Dr. R. Govindarajan
Dr. Shobha Udipi
Dr. Ramsubramanyam
Dr. Bhavna Sharma
Dr. V. Krishnakumar
Ms. Naaznin Husein
Dr. Sanjog Surve

INDEX

ADVERTISERS
Fine Organic Industries Ltd,
IFF,
Food Ingredient Specialities,
Marico,
Vasta Biotech,
Mondelez,
Zydus Wellness,
Modern Dairies,
Bee Pharmo Labs,
Kellogg,
Nutricircle,
Sensient &
ITC Ltd.

Images © Freepik.com

GOVERNING BOARD

CHAIRPERSON: Dr Shatadru Sengupta, Hardcastle Restaurants
VICE CHAIRPERSON: Mr Nikhil Kamat, Fine Organics
HON TREASURER: Dr Prabodh Halde, Marico Limited
ADVISOR: Dr. J. Lewis, Chairman, Scientific Advisory Committee, PFNDAI

ELECTED MEMBERS:
Mr. Prashant Bhat, Mother Dairy
Mr. Indranil Chatterjee, IFF
Mr. Jitin Garg, Mondelez
Dr Sakshi Bhushan, HUL
Mr. Yogish B. T, Herbalife
Mr. Rajesh Kamat, Tata Chemicals
Ms. Nirupama Sharma, Amway
Mr. R. Phani Kumar, Zydus Wellness
Dr. Kavita Tarade, DSM Firmenich

CO-OPTED MEMBERS:
Mr. C. S. Jadhav, Nutricircle
Mr. Swarn Singh, Kellogg's
Mr. Purnachand, Barentz
Dr. Agatha Betsy, ITC
Ms. Manasa, Britannia
Mr. Sunil Adsule, Reliance

CO-OPTED PAST CHAIRPERSON:
Dr. J. Lewis, Ex Marico
Dr. G. M. Tewari, Ex Coca cola
Mr. Bhupinder Singh, Vista Foods
Mr. Sakhavalkar, Ex Novartis
Mr. R. D. Shenoy, Ex Cadbury
Dr. Sanjog Surve, Ex Abbott

Cover Design & Layout by Ms. Leena Shanbhag

LET OUR CHILDREN DRINK MILK

Milk is the best natural food for children for their physical and mental growth. It has the best protein, much better than any plant protein. It has been recommended by ICMR – National Institute of Nutrition in the Dietary Guidelines.

India is currently the largest producer of milk globally and we should be proud of that. On the other hand our milk consumption is very poor and way below the recommended amount. We should encourage people, especially the young ones, to drink milk and consume milk products.

At one time, in Mumbai, in municipal schools, they used to give milk and biscuits to children and this practice is not seen now. We now have midday meal that provides cooked rice and dal or khichdi which lacks consistency and there is no control over either quality or safety in many places.

In Karnataka, the Karnataka Milk Federation provides milk to school children. In Ranchi some schools get the milk under CSR scheme where a large number of children are provided milk in schools. In Gujarat, some schools have been providing milk to school children.

The central government should own this responsibility and provide milk throughout the country so school children in every part would get this most nutritious food every day. Some may try to find a way out of this saying that some children have lactose intolerance. There are some old studies that have shown variable results.

Some claim that 65% of Indian population has lactose intolerance. Some claim that in South, there is around 60% and, in the North, only less than 30% people are lactose intolerant. We need to do systematic and thorough studies to verify that, as in spite of supposedly high incidence, the Karnataka milk programme for children is going strong.

There is a need for all the school children to get high quality nutrition. We just talk about unhealthy foods being available to children and how children get obesity etc. However, when there is an opportunity to provide them nutritious food in the form of milk, we hesitate. Some milks are now fortified with vitamins A and D.

If there is a widespread lactose intolerance, we have several companies producing lactose-free milk. They will certainly contribute to the efforts of ensuring such milk will be available to some students who are intolerant.

We should create stronger awareness about using milk in our everyday diet. Even lactose-intolerant individuals can consume curd, which not only has reduced lactose but the enzyme lactase and lactic acid bacteria present that would prevent any problem due to intolerance. These bacteria also provide health benefits.

This way, everyone can enjoy the milk nutrients that promote good health.

Prof Jagadish Pai, Editor, PFNDAI

MODERN DAIRIES®
taste happiness™

NutriLac®
NUTRITIONAL INGREDIENTS

A WORLD OF NUTRITION & WELLNESS

CASEIN | WHEY PROTEIN CONCENTRATES | LACTOSE






Modern Dairies is a leading dairy manufacturing company since 1993. The plant facilities are state-of-the-art and the company has a strong technical background, operated by a highly competent and motivated team of professionals.

Modern Dairies has one of the largest facilities for Casein, Whey Proteins and Lactose - Pharma Grade. The Company's Quality Management System has been certified by DNVGL Netherlands for updated version of ISO 9001, FSSC 22000 and ISO 14001. The facilities are approved and registered with USFDA, Export Inspection Agency & APEDA for supply of its products in the international market. NutriLac Pharma Grade Lactose confirms to the international standards of USP, BP & IP.

A Snapshot of our Customers

Abbott A Promise for Life
CADILA PHARMACEUTICALS LIMITED
Amway
Zydus Wellness
FDC Limited
Raptakos, Brett & Co. Ltd.
Coca-Cola
Hindustan Unilever Limited
BRITANNIA Eat Healthy. Think Better
Pizza Hut
Domino's Pizza
WRIGLEY A Subsidiary of Mars, Incorporated

Disclaimer: All product names, logos and brands are property of their respective owners. All company, product and service names are for identification purposes only. Use of these names, logos and brands does not imply endorsement.

MODERN DAIRIES LIMITED
Corporate Office : #98-99, Sub-City Centre, Sector 34, Chandigarh - INDIA
Works : 136 KM, G.T. Road, Karnal - Haryana
www.moderndairies.com | Email : info@moderndairies.com

®: Registered Trade Mark, TM: Trade Mark, Owners: Modern Dairies Ltd.

HOME AND AWAY FROM HOME FOOD

AUTHOR

Dr Joseph I Lewis,

Chairman, Scientific Advisory Committee, PFNDAI

The term 'ultraprocessed foods' (UPF), used in a nutritional perspective, has received comments that it lacks scientific support. A concept given meaning without clear scientific criteria may appear ambiguous, but there is also an opportunity to uncover its useful purpose.

The concern here relates to the increasing presence of 'processed' foods in Indian diets and the prospect of exceeding healthy limits for certain macronutrients. The viewpoint expressed in a previous overview was that UPF attempted to differentiate foods processed away from home (in industrial kitchens),equipped with technologies to enhance sensory attributes unavailable in home-cooked foods. Back-to-back HCES (Household Consumption Expenditure Surveys) estimate average per capita total calories, protein and fat from four food groups: (a) cereals, (b) pulses, (c) eggs, fish and meat, (d) milk and milk products, and a fifth nondescript group "Other Foods". Also, grouped as 'beverages and processed foods 'is a long list of typically away-from-home (AFH) prepared foods. The discussions now are: (a) does the term processed foods need elaboration, and (b) how do home-cooked foods differ from away-from-home foods?

In HCES, 'Other Foods' refers to a broad category of foods falling outside the major food groups. For instance, a food that is home-processed and turned into another product, e.g., milk turned into curd, is recorded by its primary ingredient – milk (not curd); similarly, pickles are recorded as vegetables. It names products after the originating food/ ingredient, e.g., milk and milk products, rather than by their processed food name. But there are exceptions. Biscuits, cakes, or snacks (burgers and samosas, etc.) purchased are grouped as processed foods. These are separate, not because of 'processing', but because they are prepared and processed elsewhere, and there are reasons for this. Included are meals/snacks from catering outlets (hotels, restaurants, and establishments),which are recorded as "served processed foods". While there are reasons and justifications for every shortcoming in grouping strategies, the conceptual framework in the survey is simple: segregate foods prepared at home from those cooked or prepared away from home. For HCES, the focus is on expenditure; however, the separation also works for monitoring the shift from home to away-from-home foods.

The most significant component within the broad category 'Other Foods' is a group of beverages, refreshments and processed foods. The list is diverse: cooked snacks (samosa, puri, paratha, momo, chowmein, idli, dosa, etc.); breakfast cereals (oats, cornflakes, muesli), baby food, cake, pastry, biscuits, bread, chocolates, papad, pickles, sauce, mayonnaise, jam, jelly chips, nachos, bhujia, namkeen, wafers, health supplements (protein powder, probiotic tablet and drinks, chyawanprash, other package processed foods (poha, other ready to eat meals..).It records all foods consumed during the relevant period, presenting an opportunity to observe specific itemised dietary shifts. There is transparency in the foods monitored.

Concerns arise when food intake shifts from controlled home environments to open-choice foods outside the home. AFH-processed foods placed into specific subgroups can be evaluated for their potential contribution to macronutrient intake and adverse health. According to HCES (2023-24), the rise in consumption of "Other Foods" in urban daily diets contributed 25.3% to protein intake, a significant source, second only to cereals (38.7%). The average daily fat intake per person – including 'other foods' - was 69.8 g, staying within the 30% upper limit of 74.8 g for a 2245 kcal diet. These findings are limited, but the framework provided is useful in assessing the quality of home and away-from-home diets.

BEE PHARMO LABS PVT.LTD
THE PLEDGE OF ACCURACY
SINCE 1988

OUR ACCREDITATIONS

FOOD PRODUCT TESTING SERVICES

We are Govt approved testing laboratories by **FDA**
Our test facilities are accredited by **NABL[ISO/IEC 17025:2017] & ISO certified(9001:2015)** by **EURO VERITAS**
Our lab has been approved by **FSSAI, BIS, APEDA**

We Can Undertake Following Food Categories for Analysis

Products

- Dairy products
- Fruits, vegitables and its products
- Cereals, pulses and its products
- Spices, Condiments and its products
- Animal origin, fishery and its products
- Alcoholic and non alcoholic products
- Oil seed, oils and its produts
- Sweets.,confectionary and its products
- Bakery products
- Sugar, Honey & jaggery
- Process, canned food products
- Feeds
- Water
- Ready to eat
- Infant substitute
- Skim Milk Powder

Testing as per FSSAI requirements.

- Pesticide residues, PAH, PCB's
- Mycotoxins
- Natually occurring toxins(NOT,s)
- Heavy metals and minerals
- Minerals & Toxic heavy metals
- Vitamins
- Antibiotics / Residues
- Food Adulteration tests
- Food additives, preservetives and artificial sweetners
- Synthetic food colour
- Antioxidents
- Packaged Drinking analysis as per IS 14543
- Drinking water as per IS 10500
- Process water IS 4251
- Shelf life study(Ambient @ Acclerated)
- Microbiological testing (Bacterial and pathogens)
- Hygiene audit /Kitchen audit
- Allergens
- Sterol Composition

Analytical Facility

1) GC MS MS
2) LC MS MS
3) ICP MS
4) AAS/ GF/ Flame
5) HPLC with UV/ FLD/ RI/ PDA
6) HS with GC FID/ TCD
7) Ion Chromatography with CD
8) Protein / Fat / Fibre Analyzer
9) Elisa Reader
10) FT-IR
11) U V Spectrophotometer
12) Partical size by Malvern (Wet & Dry)

Bee Pharmo Labs Pvt.Ltd
C-2, Hatkesh Udyog Nagar, Mira Bhayander Road, Mira Road (East), Thane - 401107
Tel: 9029774868 to 9029774877 (10 Lines)
info@beepharmo.com | food@beepharmo.com | www.beepharmo.com

WHOLE GRAIN FLOURS: FOR TRANSFORMATION TO HEALTHIER DIETS

AUTHORS

Ms Nupur Agarrwal
Manager
Nutrition Sciences

&

Ms Vandana Rajiv
Executive
Nutrition Sciences

ITC

Health status of Indians

India's health landscape is undergoing a significant shift, with the country facing an increasing burden of non-communicable diseases (NCDs) alongside persistent issues of undernutrition[1]. The country is confronted with the "triple burden of malnutrition"—undernutrition, overnutrition manifested as non-communicable diseases (NCDs) such as obesity, digestive disorders, hyperglycaemia, hyperlipidaemia, and hidden hunger with essential micronutrient deficiencies, affecting both children and adults across socio-economic strata[2].

According to the National Family Health Survey (NFHS-5,2019–21), obesity rates have increased significantly, with 24% of women and 22.9% of men (aged 15–49y) diagnosed as overweight or obese. Urban populations are disproportionately affected, with obesity rates at 33.2% among women and 29.8% among men, compared to 19.7% and 19.3%, respectively, in rural areas. Prevalence of childhood obesity has increased from 2.1% (NFHS-4, 2015-2016) to 3.4% (NFHS, 2019-21)[3]. The Indian Council of Medical Research (ICMR-INDIAB, 2023) also highlighted a growing diabetes epidemic, revealing that 101 million Indians are living with diabetes, and an additional 136 million are prediabetic[4]. In India, NCDs related deaths have increased from 36% to 65%, from 1990 to 20195.

A major contributor to this rising health burden is sub-optimal dietary patterns that fails to provide adequate nutrition to support overall health.

Enduring Value

INDIA'S NO.1 ATTA BRAND*

AASHIRVAAD

Sarvagunn Sampanna

*ITC Limited claim as per NielsenIQ Retail Index data for period MAT June'24 for the India market in the Atta segment of Packaged Atta Category.

Fig.: ICMR-NIN, My Plate for the day for 2000 kcal

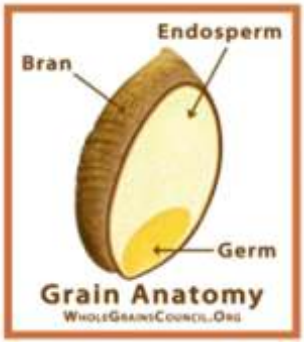
It results from insufficient intake of essential nutrients, and excessive and imbalanced consumption of various food groups with limited inclusion of a variety of whole grains such as Millets, Oats, Amaranth and so on[6].

Dietary Recommendations

Developed by the ICMR–National Institute of Nutrition, My Plate for the Day offers a simple guide to achieving a balanced diet by sourcing energy from different food groups. The plate visually represents the recommended proportions of different food groups needed to meet the requirements of a 2000 kcal Indian diet. The model emphasizes the importance of obtaining both macronutrients and micronutrients from diverse food sources.

For a reference Indian adult with a 2000Kcal daily calorie intake, the Dietary Guidelines for Indians suggests 250g/day of cereals & millets as one of the key sources of complex carbs and energy. Out of this at least 50% of cereals should be consumed as wholegrains (minimally polished), which must include the bran, germ, and endosperm in the same ratio as the original grain. The millets can be consumed 30-40% of the total recommended cereals. The recommended dietary guidelines also suggest to obtain 10-15% of total energy from Proteins and emphasises on obtaining good quality proteins and essential amino acids from various food groups. Healthy Adults are advised to consume at least 400g of vegetables & 100g of fruits each day along with 35g of nuts and seeds.

It is also important to note that in addition to grains, other food groups like Pulses & Legumes, in the ratio 3:1 (cereals: pulse) must be incorporated which can help meet requirement of all essential amino acids[10].



Whole grains as important component of balanced diet

In India, grains have been an important component of the diet of people. Studies from the early 1950s revealed that millets or coarse grains were a significant part of the grains consumed. Inclusion of whole grains in the diet is recommended in dietary guidance around the world because of their associations with increased health benefits[7].A whole grain kernel is composed of three main parts: the endosperm, germ, and bran. The bran layer is high in fibre, while the germ provides essential vitamins, minerals, lignans, and various phytochemicals (including phenolic acids, polyphenols, and phytosterol compounds)[8,9].

Incorporating whole grains into the daily diet can enhance the overall quality of carbohydrate intake. By doing so, the macronutrient profile of the diet shifts more closely towards recommended levels, helping to achieve better balance without requiring a conscious reduction in carbohydrate consumption[11].

Some of the common sources of Whole grains are[12]: -

- Whole Wheat
- Amaranth
- Maize
- Barley
- Buckwheat
- Corn
- Millets like Ragi, Jowar, Bajra
- Oats
- Quinoa
- Brown Rice
- Rye

Vital role of Whole grains for health

Wholegrains are rich sources of dietary fibre, a complex form of carbohydrate, found naturally in plant-based foods. Although fibres are not absorbed, they play a crucial role in maintaining digestive health and overall wellbeing.

Whole grains have been associated with several other health benefits. A synergistic effect of different constituents of the whole grain (bran, endosperm & kernel) contributes to their benefits[13]. Whole grains are rich sources of micronutrients such as vitamins and minerals, phytonutrients, fibre and bioactive compounds and induce favourable changes in the gut microbiota (microbes) [10]. Therefore, incorporating whole grains into Indian diets will not only improve carbohydrate quality, but also deliver other micronutrient advantages[14].

Fibre-rich foods like whole grains typically have higher volume and lower energy density, enhance satiety, and support weight management. Additionally, fibre contributes to regular bowel movement, blood sugar regulation, cholesterol control, and overall gut health. Inadequate fibre intake is commonly linked with digestive issues such as constipation. Individuals with high intakes of dietary fibre are significantly at lower risk for developing cardiovascular diseases (CVD), stroke, hypertension, diabetes, obesity, and some specific gastrointestinal diseases[10].

Whole grains have also shown to be a good source of antioxidants. Studies have shown that the antioxidant activity of Whole Grains foods is not only due to antioxidant vitamins such as vitamin E and minerals such as selenium, but also due to the presence of phyto antioxidants such as phytates, and phenolics and flavonoids. The most abundant antioxidants in whole grains are phenolic acids, which are highly concentrated in the bran and the germ[15,16].

The World Health Organization (WHO) recommends that the consumption of >25 g of total dietary fibre should be through wholegrain cereals, fruits and vegetable for the prevention of chronic diseases.

How to identify wholegrains & Incorporate in your daily diet

Wholegrains are commonly used in Indian households or used by food industry in food products post minimal processing. Wholegrains can be easily incorporated in daily diets provided we understand to identify them. One must look for ingredients like whole grain, whole wheat, whole [other grains], oats, oatmeal (including instant oatmeal), ragi, jowar or products labelled “100% whole grain” or “whole wheat” as the primary ingredient, as this typically indicates that the product is predominantly whole grain[18].

Simple household methods like Soaking, popping, puffing, sprouting/ germinating, malting and fermenting can also be adopted to significantly enhance the digestibility

and absorption of nutrients from whole grains. Sprouted whole grains contains the bran, endosperm and germ, along with the bioavailability of nutrients intact[10].

Flours as source of whole grains and other benefits

1. Whole wheat flour (Atta)

Whole wheat flour is crafted to retain all the essential components of wheat, including dietary fibre, protein, vitamins, and minerals. It serves as one of the most convenient ways to add whole grains to your daily balanced diet. These nutrients are preserved through modern milling techniques that ensure taste and nutrition.

Nutritional Highlights

- Rich in fibre and protein – supports satiety and helps manage calorie intake.
- Source of key vitamins and minerals – including B vitamins (B1, B3), iron, magnesium, and zinc.
- Lower Glycaemic Index (GI) – compared to cooked rice, making it beneficial for sustained energy and better metabolic health.

Chapati vs. Rice: A Nutritional Comparison

- Fibre: 3 chapatis (≈90 g whole wheat flour) provide 34% of daily RDA, while 100 g of cooked rice offers only 2.4%.
- Protein :3 chapatis provide 17.6%of daily RDA , compared to only 3.8% from 100 g cooked rice .

Incorporating whole wheat flour into your meals is a simple yet powerful step towards meeting your daily nutritional needs—supporting digestive health , providing sustained energy , and contributing to overall well being .

2. Atta with Multigrains

The incorporation of additional ancient grains into whole wheat flour offers further nutritional benefits. Grains such as amaranth (rajgira), barley (jau), pearl millet (bajra), finger millet (ragi), and sorghum (jowar) are naturally rich in fibre, protein, and essential micronutrients. When blended with whole wheat flour, these grains enhance the nutritional density of commonly consumed staples like roti and chapati 11. Moreover, the inclusion of legumes and other beneficial grains such as soy, chana, and maize can improve protein quality, providing essential amino acids alongside iron, B-vitamins, and other micronutrients.

3. High Protein Flours

Proteins in the human body are continuously broken down and rebuilt, yet unlike fats and carbohydrates, the body does not maintain large reserves of protein or essential amino acids. This makes regular protein intake critical for maintaining muscle mass, supporting metabolic functions, and promoting overall health[17].

High protein flours, formulated by blending wheat with legumes (e.g., Bengal gram, soy) and other grains (e.g., oats), significantly enhance protein quality. Such formulations aid in meeting the recommended dietary allowances (RDA) of protein while also contributing valuable dietary fibre, B-vitamins, and minerals.

Importantly, these flours offer multiple health benefits, including:

- Muscle protein synthesis and maintenance of lean body mass.
- Satiety enhancement, supporting appetite regulation and weight management.
- Prevention and management of non-communicable diseases (NCDs) through improved nutritional quality.

Thus, high protein flours represent an effective dietary strategy for supporting both nutritional adequacy and metabolic health.

4. Khapli atta

Khapli Atta, derived from Emmer wheat (an ancient variety), is recognized for its distinctive nutritional profile and health benefits. It is particularly rich in dietary fibre, protein, iron, and vitamin B1 (thiamine), making it a valuable component of a balanced diet.

Key attributes include:

- Low in sugars, fat, saturated fat, and free from trans fats, making it a heart-healthy grain option.
- Rich in thiamine (vitamin B1), which plays a critical role in energy metabolism and supports neurological function.
- Source of iron, essential for oxygen transport and prevention of anaemia.
- High dietary fibre and protein, which contribute to satiety, weight management, and overall metabolic well-being.

Together, the fibre, protein, iron, and B-vitamins in Khapli Atta support an active lifestyle while offering a naturally wholesome alternative to modern refined flours.

5. Atta with value added ingredients

Atta with value added ingredients such as beetroot, methi etc also enhances the flour's nutritional density and enhance the taste profile as well. Such flours provide a convenient and culturally acceptable vehicle for dietary diversification, enabling the adequate intake of various food groups without major dietary shifts.

6. Customised atta for personalised benefits:

Customised atta is developed by selecting specific wheat varieties and incorporating additional grains, pulses, or tailored milling processes to achieve targeted nutritional outcomes. By adjusting the grain mix, atta can be enriched for higher protein quality, fibre content, or specific micronutrients in alignment with individual dietary needs.

This personalisation approach not only enhances nutrient density but also allows consumers to adapt the product to their taste preferences and health goals, thereby combining functionality with flexibility in everyday diets.

Other Beneficial Impacts of processing of flours

In addition to above, whole wheat flour which is available in packed format, also undergoes multiple quality checks to ensure that every pack meets safety and nutritional standards and must also ensure that the packing protects the product from contamination, deterioration and absorption of moisture. Also, it should not impart any objectionable taste and odour19. The packs have to also ensure proper labelling of ingredients, allergens if any, nutrients, shelf life, net weight for consumer awareness20. Packaged whole wheat flour, also known as atta is manufactured in hygienic, state-of-the-art facilities where every stage—from sourcing to grinding to packaging—is carefully monitored. These automated processes reduce the risk of contamination, ensuring a cleaner and safer product. In today's health-conscious world, choosing the right kind of flour for your family is important and contributes to transformation to healthier diets.

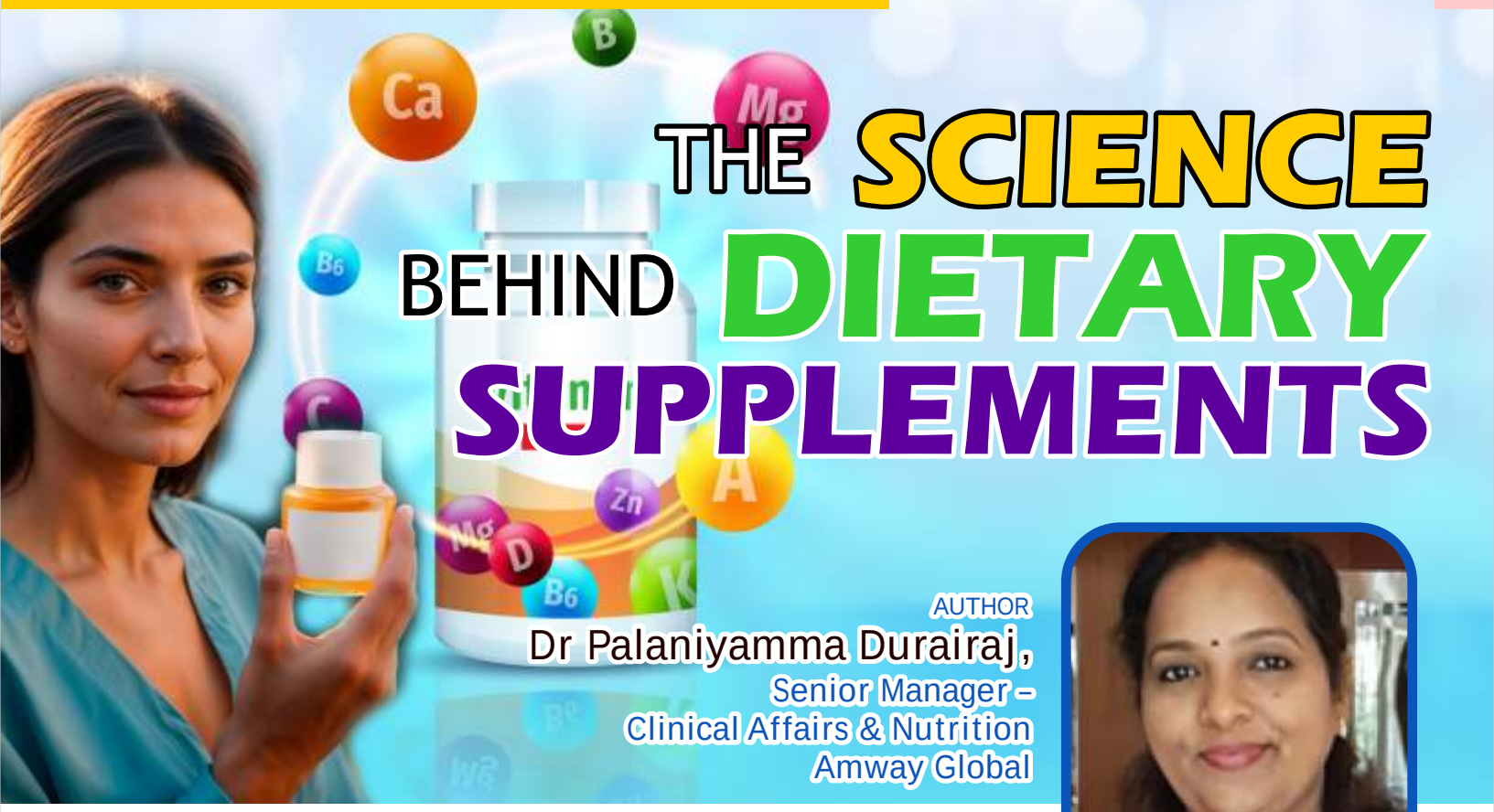
Conclusion

Whole-grains consumption remains, on average, significantly below recommended levels, despite the growth in availability of whole-grain foods. With evidence pointing to widespread gaps in awareness and daily practices, there is a clear indication to shift diets towards whole grains and products made from the same like whole wheat flour, multigrain flour, high protein flour etc from a neglected aspect of health to a public health priority.

Promoting nutrition education, encouraging consumption of such products, and empowering individuals through awareness will be essential steps in this direction.

References

1. NITI Aayog. Government of India. Healthy States Progressive India: Report on the Ranks of States and Union Territories.
2. Basheer, S., et al. The Food and Nutrition Status in India: A Systematic Review. In: Grover, A., Singh, A., Singh, R.B. (eds) Sustainable Health Through Food, Nutrition, and Lifestyle. Advances in Geographical and Environmental Sciences, 2023.
3. Ministry of Health and Family Welfare. National Family Health Survey (NFHS-5), 2019-21: India Fact Sheet.
4. Anjana, RM et al. Metabolic non-communicable disease health report of India: the ICMR-INDIAB national cross-sectional study (ICMR-INDIAB-17). The Lancet Diabetes & Endocrinology, Volume 11, Issue 7.
5. Shrivastav, R., et al. Accelerating policy response to curb non-communicable diseases: an imperative to mitigate the dual public health crises of non-communicable diseases and COVID-19 in India (2023). The Lancet Regional Health - Southeast Asia, Volume 10.
6. Peeters, A. Obesity and the future of food policies that promote healthy diets. Nat Rev Endocrinol 14, 430–437, 2018.
7. Whole Grains for Health, International Life Sciences Institute-India WHOLE GRAINS FOR HEALTH India & South Asian Region.
8. McRae M. P. (2017). Health Benefits of Dietary Whole Grains: An Umbrella Review of Meta-analyses. Journal of chiropractic medicine, 16(1), 10–18. https://doi.org/10.1016/j.jcm.2016.08.008
9. Whole Grains Council, https://wholegrainscouncil.org/whole-grains-101
10. ICMR- NIN, Dietary Guidelines for Indians 2024
11. Dixit, A. (2011). Incorporation of whole, ancient grains into a modern Asian Indian diet to reduce the burden of chronic disease. Nutrition reviews, 69(8), 479–488. https://doi.org/10.1111/j.1753-4887.2011.00411.x
12. Whole Grains A-Z, Whole Grains Council. WGC-WholeGrainsAtoZ2017.pdf
13. Van der Kamp JW, et al. Consensus, Global Definitions of Whole Grain as a Food Ingredient and of Whole-Grain Foods Presented on Behalf of the Whole Grain Initiative. Nutrients. 2021;14(1):138. Published 2021 Dec 29. doi:10.3390/nu14010138
14. ICMR-NIN Recommended dietary allowances and estimated average requirements nutrient requirements for Indians, 2020.
15. A Fardet. Whole Grains from a Mechanistic View. Proceedings Whole Grains Summit 2012. AACC International 2013.
16. Yu, L., Nanguet, A. et al (2013). Comparison of Antioxidant Properties of Refined and Whole Wheat Flour and Bread. Antioxidants, 2(4), 370-383. https://doi.org/10.3390/antiox2040370
17. Jones, J. M., (2010). Whole grains: benefits and challenges. Annual review of food science and technology, 1, 19–40. https://doi.org/10.1146/annurev.food.112408.132746
18. Identifying Whole Grain Products, Whole Grains Council
19. Food Safety and Standards (Food Products Standards And Food Additives) Regulations, 2011
20. Food Safety and Standards (Packaging and Labelling) Regulations, 2011.



THE SCIENCE BEHIND DIETARY SUPPLEMENTS

AUTHOR
Dr Palaniyamma Durairaj,
Senior Manager – Clinical Affairs & Nutrition
Amway Global

Introduction

Everyone wants good health, and nutrition is the only thing which touches the physical and mental aspects of health. However, many people worldwide do not consume sufficient amounts of essential nutrients. Factors such as food processing, storage, soil depletion, cooking methods and stress can affect the nutrients obtained from food.

While dietary supplements can help address nutritional deficiencies, they should not replace a balanced diet. Understanding the science behind supplementation and adopting a well-rounded approach to nutrition are proactive steps toward better health.

Everyone wants good health and for that we need to know what "Health" really means- all know the definition by World Health organization (WHO) and Nutrition is the only thing which touches the physical, mental, and all aspects of Health.

Therefore, Dr. LINUS PAULING (Twice Awarded Nobel Prize) has stated *"Almost all diseases in the body are due to a nutritional deficiency"*.

Global Nutrient Deficiencies

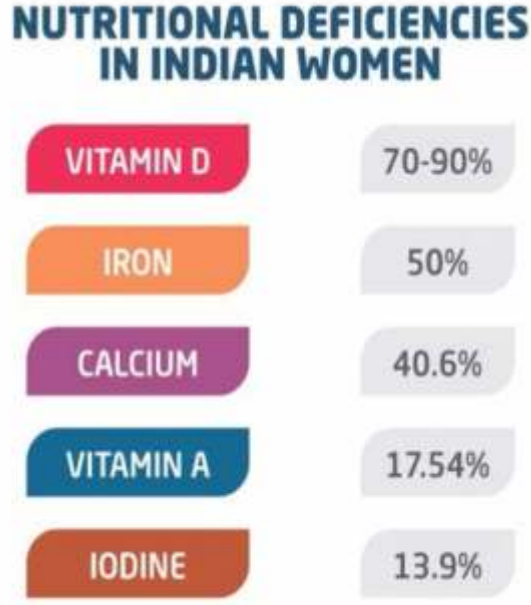
More than 5 billion people worldwide do not consume sufficient amounts of iodine (68% of the global population), vitamin E (67%), and calcium (66%). Additionally, over 4 billion people do not meet the required intake of iron (65%), riboflavin (55%), folate (54%), and vitamin C (53%).

Some facts about India's Micronutrient deficiency and its impact on Indians Health

(https://nhm.gov.in/WriteReadData/l892s/1405796031571201348.pdf)

India accounts for nearly one-third of the global population suffering from micronutrient deficiencies.

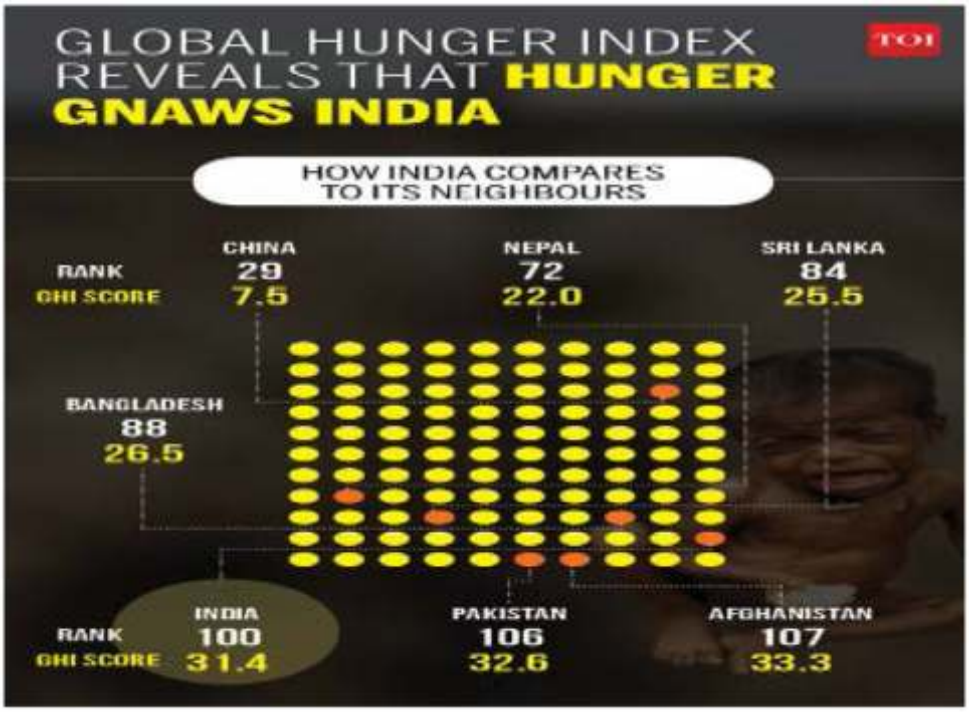
Prevalence of anemia by state in India, CNNS 2016-18



The country has a child stunting rate of approximately 35%, and malnutrition was a leading risk factor for loss of Disability-Adjusted Life-Years in 2016, causing an estimated 0.5% of all deaths. Over 35% of Indian soils are deficient in zinc, while about 11% are deficient in iron, exacerbating the issue of micronutrient deficiencies among the population.

Protein deficiency is an epidemic that is gripping us Indians faster than we know.

Protein deficiency is an escalating concern in India, yet it remains overlooked by most people. Unlike calcium or iron deficiencies, which are acknowledged, protein inadequacy is not widely recognized. About 73% of urban Indian diets are protein deficient, and an alarming 93% of people are unaware of their daily protein requirements. Many assume that consuming a small bowl of dal is sufficient to meet their protein needs, but this is a misconception. The general requirement is 1 gram of protein per kilogram of body weight per day, though this varies based on activity levels and specific physiological conditions such as pregnancy. People engaged in intensive workouts require an additional 0.5 grams of protein, while those with moderate activity levels may not need extra supplementation. Addressing this gap is crucial for improving overall health.



Veg DHA Omega-3 Throughout the Life Cycle

life's DHA™ – Veg DHA Omega-3

Health and wellness throughout life

***life's* DHA™ Supports:**

- A healthy pregnancy in mothers to be
- Brain and eye development for foetuses, infants and children
- Cardiovascular health in adults
- Mental health in senior citizens

Also from Vasta:

Lactoferrin for ID/IDA, healthy pregnancy and for immune health;
Nucleotides for infant nutrition; **Phosphatidylserine** for cognition; **Pro/Postbiotics** for targeted digestive & other benefits;
SoyLife manages hormonal imbalance/menopausal complaints; **FenuLife** antacid, reduces GERD; **AB Fortis** highly bioavailable tasteless iron;
Nisin & Natamycin for shelf life extension; … and many other ingredients!

All 100% Natural

VASTA BIOTECH

Vasta Biotech Pvt. Ltd.

M: +91 98416 03903
T: +91 44 24993095 • F: +91 44 24991007
vasta@vastabiotech.com • www.vastabiotech.com

The Triple Burden of Malnutrition

The term "triple burden of malnutrition" refers to the coexistence of three nutritional challenges within a population: undernutrition (stunting and wasting), micronutrient deficiencies (hidden hunger), and overnutrition (overweight and obesity). This phenomenon is particularly prevalent in low- and middle-income countries experiencing rapid nutritional and lifestyle transitions due to globalization and economic development.

Undernutrition and micronutrient deficiencies hinder proper growth and increase susceptibility to diseases, while overnutrition contributes to obesity-related conditions such as diabetes and cardiovascular diseases. Effective public health strategies must incorporate balanced diets, improved food systems, and targeted nutrition programs to combat these challenges.

Impact of deficiency of micronutrients- Micronutrient Triage Theory by Bruce Ames

The human body prioritizes the use of scarce micronutrients for immediate survival rather than long-term health maintenance.

An example of this is vitamin K deficiency: when vitamin K levels are low, the body prioritizes essential metabolic functions in the liver, leaving other vitamin K-dependent processes, such as bone formation and cardiovascular protection, neglected. This can lead to age-related diseases like osteoporosis, cancer, and heart disease. The same principle applies to selenium deficiency, emphasizing the importance of adequate micronutrient intake.

Why Do We Need Supplements?

Although people consume breakfast, lunch, and dinner, they may still not receive all essential micronutrients due to several factors.
These include:

- Food processing,
- Storage,
- Transportation,
- Soil depletion,
- Cooking methods,
- Pesticide use,
- Genetically modified organisms (GMOs),
- Environmental pollution,
- Stress.
- Certain age groups, such as children, pregnant and lactating women, and the elderly, require additional supplementation to meet their nutritional needs.

The Supplement Science

The drug development process comprises several critical stages:
Stage I: Discovery and Development, researchers identify potential compounds that may effectively target specific diseases.
Stage II: Preclinical Research, these compounds undergo laboratory and animal testing to assess their safety and biological activity. If results are promising, the process advances to Clinical Research,
Stage III: Clinical Research which is conducted in multiple phases:
Phase I involves administering the drug to a small group of healthy volunteers to evaluate safety and determine appropriate dosage ranges;
Phase II expands the study to a larger patient group to assess efficacy and further evaluate safety;
Phase III involves large-scale testing to confirm effectiveness, monitor side effects, and compare the drug to commonly used treatments. Upon successful completion of these trials, a New Drug Application (NDA) is submitted to regulatory authorities, such as the U.S. Food and Drug Administration (FDA), for a thorough review.

If approved, the drug becomes available for patient use, with ongoing Post-Market Safety Monitoring to ensure long-term safety and effectiveness.

Advantages of validating Supplements

The validation of dietary supplements is essential for ensuring safety and efficacy. Scientifically validated supplements undergo rigorous testing, reducing the risk of adverse effects and increasing consumer confidence. While the validation process is complex and costly, its benefits outweigh the challenges by improving product quality, safety, and effectiveness. High-quality supplements contribute to trust and transparency in the industry and have the potential to revolutionize public health.

Factors contributing to the Effectiveness of Nutrition Supplements

The effectiveness of a nutritional supplement depends on multiple factors, including the quality of ingredients, method of delivery, dosage, and bioavailability. High-quality supplements use pure, potent, and safe ingredients manufactured under stringent quality control measures. The form in which nutrients are delivered also plays a critical role in absorption. For example, different forms of calcium and vitamin B12 vary in bioavailability. Furthermore, individual factors such as age, genetic variations, gut health, and prolonged medication use can impact nutrient absorption and utilization.

Scientific Evidence Supporting

Supplementation

Vitamin K2 plays a crucial role in modifying proteins that regulate calcium deposition in the body. One key protein, matrix Gla protein (MGP), is activated by vitamin K2 to prevent soft tissue calcification. MGP undergoes gamma-carboxylation with the help of vitamin K2, which is then further processed to become the active form that inhibits calcification.

Scientific Evidence -Role of Protein in Glucose control

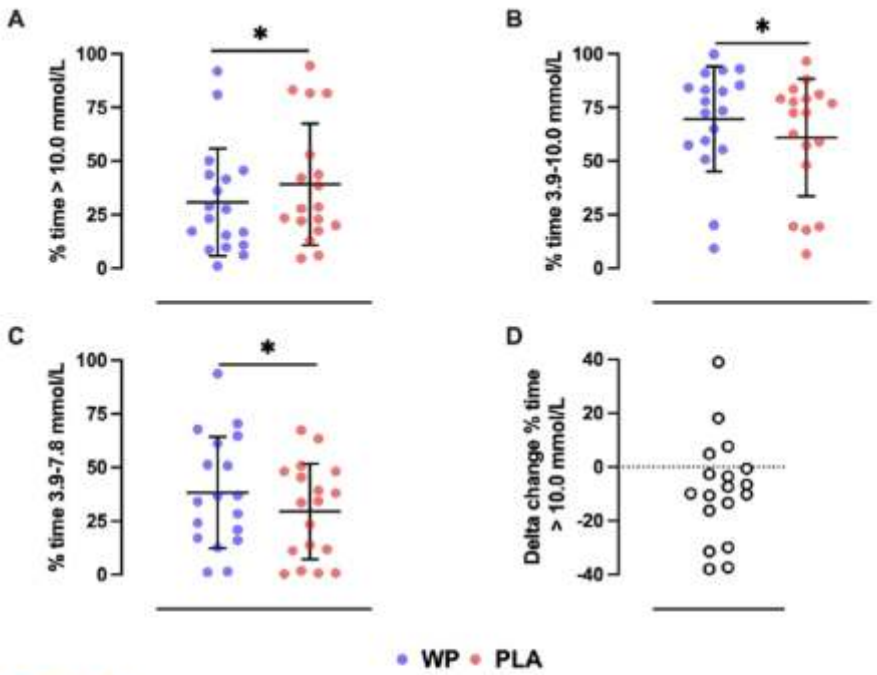
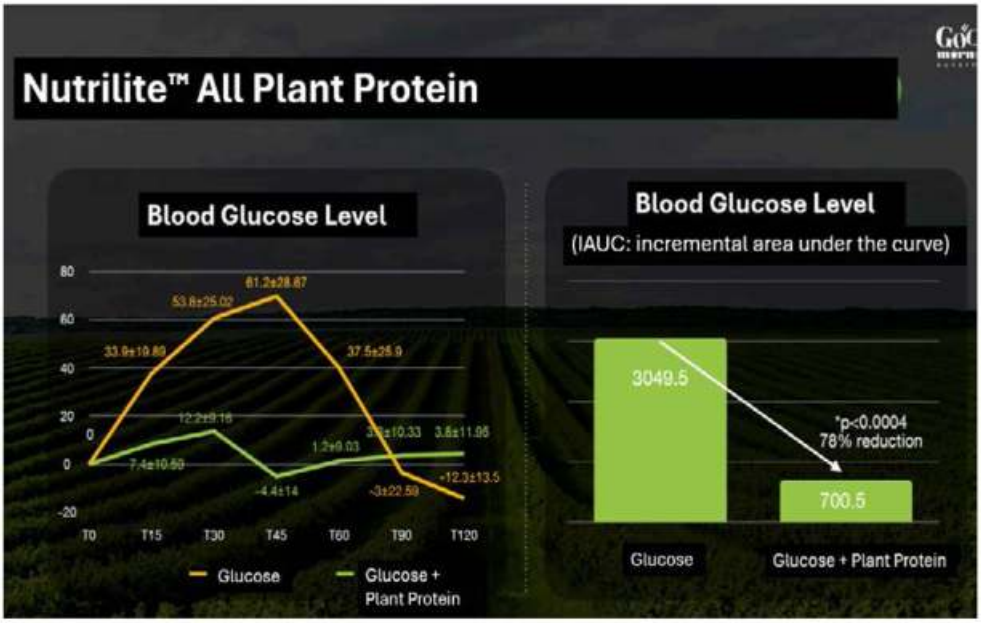


Figure 1 The mean±SD percentage of time spent per day in (A) hyperglycemia (>10.0 mmol/L), (B) euglycemia (3.9–10.0 mmol/L), and (C) normoglycemia (3.9–7.8 mmol/L) during 7 days of free-living with premeal supplementation of a whey protein (WP) (blue circles) or placebo (PLA) (red circles) preload. Panel (D) depicts the per patient delta change in the percentage of time spent >10.0 mmol/L with premeal WP supplementation relative to PLA. *Denotes a statistical treatment effect as measured by a paired samples t test or Wilcoxon signed rank test (p<0.05).

Fig 1 from: Thrice daily consumption of a novel premeal short containing low dose of whey protein increases time in euglycemia - BMJ Open Diabetes Research & care - Smith et al.(https://drc.bmj.com/content/bmjdrc/10/3/e002820.full.pdf)

Another protein, osteocalcin (OC), also known as bone Gla protein, is activated by vitamin K and promotes bone growth while also inhibiting calcium and phosphate precipitation, preventing soft tissue calcification. When there is insufficient vitamin K2, MGP remains inactive, leading to calcium buildup in blood vessels, which increases the risk of arterial stiffness and atherosclerosis.



The BMJ Open Diabetes Research & Care published a study by Smith et al. (2022) that examined the impact of pre-meal whey protein (WP) on individuals with type 2 diabetes. This randomized, placebo-controlled study involved 18 participants who consumed either a WP shot or a placebo before meals for 7 days. The primary objective was to determine if WP could reduce hyperglycemia and increase time in euglycemia. The study found that pre-meal WP supplementation reduced daily hyperglycemia and increased time in the euglycemic range without increasing hypoglycemia risk. These findings suggest that incorporating a pre-meal WP shot could be a useful approach for regulating glycemia in those with type 2 diabetes.

In recent years, scientific evidence has increasingly emphasized the crucial role that protein plays in glucose control. An in-house study has reinforced these findings, contributing to the growing body of knowledge surrounding nutrition and its impact on metabolic health. Proteins are essential macronutrients that influence glucose metabolism, aiding in the regulation of blood sugar levels and preventing fluctuations that can lead to metabolic disorders.

Level of evidence Pyramid - Nutritional supplements

In the field of nutrition, decision-making is based on current scientific evidence. However, the accessibility of information today has led to a proliferation of misinformation and pseudoscience, making it imperative to critically examine the evidence-based framework in nutrition. The evolving nature of nutrition science necessitates collaboration between researchers, policymakers, and practitioners to ensure accurate interpretation and implementation of scientific findings. The role of nutrition professionals in translating research into practical dietary guidelines is critical for improving public health outcomes.

Personalized nutrition the future of food? Tailored to individual consumers

Proteomics has revealed the complexity of the human proteome. Unlike the genome, which remains relatively stable, the proteome is highly dynamic due to post-translational modifications and alternative splicing. Research has identified over 40,000 genes capable of transcribing more than 500,000 proteins, underscoring the intricate biological processes that govern human health.

Personalized nutrition is a novel public health strategy aiming to promote positive diet and lifestyle changes. Tailored dietary and physical activity advice may be more appropriate than a generalised 'one-size-fits-all' approach as it is more biologically relevant to the individual. Information and computing technology, smartphones and mobile applications have become an integral part of modern life and thereby present the opportunity for novel methods to encourage individuals to lead a healthier lifestyle.

Nutrigenomics vs Nutrigenetics

Nutrigenomics and nutrigenetics are two complementary fields that explore the interaction between nutrition and genetics.

Nutrigenomics examines how nutrients impact gene expression, which affects metabolic pathways and can either lead to optimal health or biochemical imbalances like inflammation and oxidative stress. Epigenetic modifications, changes in the transcriptome, proteome, and metabolome all determine an individual's physiological state. A better understanding of these processes can help tailor dietary interventions to support long-term health.

Nutrigenomics illustrates how the balance of nutrients impacts gene expression, leading the body to various biochemical routes and endpoints. This process sequentially affects the epigenome, which involves chemical changes to DNA and histone proteins that can be inherited by offspring. It also affects the transcriptome, which is the complete set of all RNA molecules produced. Additionally, the proteome, or the entire set of proteins expressed at a given time under defined conditions, is impacted. Finally, the metabolome, which includes the complete set of small-molecule metabolites like metabolic intermediates, hormones, and signaling molecules, is also affected. These effects can lead to a healthy physiological state or result in fundamental metabolic disruptions such as excessive inflammation, oxidation, neurologic stress, and metabolic stress.

A study published in nature publication using a mathematical model showed that Nutrilite Daily Plus, a multi-nutrient botanical formulation, can significantly reduce physical, mental, oxidative, and inflammatory stress. The formulation contains Gotukola, acerola cherry, elderberry, and purple carrot, along with essential vitamins and minerals. The model indicated that the formulation could lead to a decline in key stress parameters like ROS, TNF-α, blood pressure, cortisol levels, and PSS scores. The study suggests that Nutrilite Daily Plus may help relieve stress and move individuals towards a healthier state.

Government Initiatives in India

To address nutritional deficiencies, the Indian government has initiated multiple programs. These programs aim to combat conditions like anemia, nutritional blindness, and goiter, as well as to improve overall nutrition in women and children.

The initiatives range from providing iron and folic acid supplements to supporting pregnant and lactating women. The programs include:

- The National Nutritional Anemia Prophylaxis Program (1970)
- Weekly Iron and Folic Acid Supplementation Program (2013)
- National Prophylaxis Program against Nutritional Blindness due to Vitamin A Deficiency (1970)
- The National Goitre Control Program (1962)
- National Nutrition Mission (2003)
- Pradhan Mantri Matru Vandana Yojana (2017) for pregnant and lactating women
- PM Poshan Abhiyaan (2018) for improving nutrition parameters in children and women

Future Trends and Directions

The field of nutrition is constantly evolving, with emerging trends and research shaping our understanding of diet and health. Current research is exploring personalized nutrition, the role of the gut microbiome, and the potential of plant-based supplements. Staying informed about these advancements is crucial for making informed decisions about our health and well-being.

- Personalized nutrition: Research focusing on individualized dietary recommendations based on genetic and lifestyle factors.
- Nutrigenomics: Exploration of the interaction between nutrients and gene expression for personalized health outcomes.
- Microbiome-based supplements: Investigation of supplements targeting gut microbiota for digestive health and immune function.
- Insilico-computational studies
- Plant-based supplements: Increasing interest in plant-derived supplements
- Advancements in research methodologies (e.g., meta-analyses, systematic reviews)
- Technology's role in facilitating evidence-based practice (e.g., nutrition apps, telehealth)
- Continued professional development and education
- Collaboration with other healthcare disciplines

Conclusion

While dietary supplements play a vital role in addressing nutritional deficiencies, they should not be seen as substitutes for a balanced diet. The key to good health lies in making informed food choices, with supplements serving as a complementary addition to enhance overall well-being.

By understanding the science behind supplementation and adopting a holistic approach to nutrition, individuals can take proactive steps toward better health.

Complan

zydus wellness

PROTEIN is critical during the child's growing years. Hence COMPLAN !

Complan contains **63% more protein#** than regular heath drink.

"I AM A COMPLAN BOY"

2X FASTER GROWTH*

SUPPORTS MEMORY & CONCENTRATION*

Refer Individual pack for mandatory regulatory & statutory information. Mnemonics are for creative visualization.

#Complan New Royale Chocolate contains 18 g Protein/ 100 g, while the leading malt-based food drink for children has 11 g Protein/100 g. This means that Complan has 63 % more protein. (Complan New Royale Chocolate - pack January 2025, and malt-based food drink - pack January 2025). In one serving (33 g) of Complan contains 5.94 g protein, whereas one serving (27 g) of the malt-based food drink contains 2.97 g of protein. Recommended Two serve per day. *Refers to the outcome of clinical study published in Ind. J. Nutr. Dietet; (2008). Refer pack for more details. 1.1.2 Dairy Based Beverage Mix (Proprietary Food).

NATURAL COLOURS- BAKERY PRODUCTS

AUTHORS

Dr Hormazdiar Patva & Ms Mukta Barve
Technical Director Application Manager
Sensient India Pvt Ltd
A30, Khairane TTC,Koparkhairane, Navi Mumbai 400705
(T: 022 6292 5307)

Baked goods play a very important role in elevating moods by "stimulating brain's reward system. It is therefore no surprise that people have turned to eating mere sweet treats.

US FDA has announced new regulations to phase out petroleum based synthetic dyes. This initiative is a part of broader effort to improve public health & safetythereby reducing exposure to potentially harmful synthetic dyes & promote use of safe natural, alternatives. Natural colours are increasingly being used in bakery products as a shift towards

- Cleaner label (consumer appeal)
- Healthy connotation (free from synthetic colours)
- More sustainable solution (derived from renewable sources, eco-friendly production),
- Flavour & Nutrition (Some colourants add subtle Flavours and nutrients like antioxidants)

Affordable indulgence can fill the gap for consumers'indulgence; quality & convenience are all important factors consumers are looking for in baked goods.

Applications in Bakery Products

- Cakes & Cupcakes: Used in batters and frostings for vibrant, natural hues
- Cookies & Crackers: Incorporated into dough for consistent colour
- Icing & Decorations: Mixed into glazes, sprinkles, fondants and creams
- Dry Mixes: Added to pre-packaged mixes for colour consistency after baking

Nat Stable Red

All Natural Heat Stable Red Colour

- Unprecedented heat stability that does not brown during heating step
- Clean and simple ingredient Labelling
- Broad Range of Shades possible in combination with other Natural Colours
- Minimizes challenges of off-notes
- Eliminates product texture issues
- Potential Carmine Replacer
- Ideal applications - Bakery, Savoury, Extrusion, Pan coated Confectionery

UBERBEET

SENSIENT®

Sensient India Pvt Ltd
A30, Khairane TTC, KoparKhairane, Navi Mumbai, 400705
Contact No : 02262925300/salesindia@sensient.com

In bakery products such as cakes, cookies, muffins, crackers, pastries- natural colours are typically derived from botanical sources like turmeric, beetroot, carotenoids (carrots, palm, tomato, annatto), paprika, anthocyanins (black carrot, grape, red radish, purple cabbage etc), chlorophyll (alfalfa leaf, spinach, mulberry leaf etc) spirulina. These pigments can be used in most of bakery products depending on their stability.

Selection of a right Natural colour/ or replacing a synthetic colour with Natural involves balancing colour intensity, compatibility with the product matrix, stability under processing conditions. Various techniques such as encapsulation, precise powder blend, dispersion format make Natural colour more viable for commercial scale bakery production.

Since Natural colours are derived from fruits/vegetable/spices/flowers they are more safe than synthetic petroleum-based dyes that trigger allergic reactions, hypertension etc. From sensory and marketing preview they help bakery products stand out with more authentic earthy tones that resonate health-conscious consumers, plus elevate brand image allowing for a premium positioning.

Environmentally Natural colours are more sustainable as they are sourced from agricultural produce, plus some pigments are extracted from food processing by products, contributing to circular economy models.
Natural colours often face fewer regulatory scrutiny compared to synthetic ones.

Improving stability of Natural colours:

Microencapsulation is one such technique which involves pigment encapsulated within a protective matrix of modified starch, maltodextrin or gum acacia. This shields the colour from oxidative degradation and thermal stress during baking.

Co-pigmentation is a technique used particularly for anthocyanins. By forming complex with phenolic compounds, amino acids, metal ions, colour intensity and resistance to pH fluctuations can be significantly improved.

pH adjustments: pH plays very critical role particularly for pigments like anthocyanins, which exhibits colour shift depending on acidity. Anthocyanins express bright red colour at pH of 3.5 and changes to maroon to blue shade toward neutral and mostly they are not stable at neutral pH. For colours like carotenoids and curcumin pH impact on these colours are not seen and are more stable across wider pH range.

Antioxidant effect:

Antioxidants like Vitamin C when added to anthocyanin they deteriorate very fast, on the other hand it protects colour when added to carotenoids. For oil soluble Natural colours antioxidants like tocopherol, rosemary extracts can mitigate oxidative stress and prolong colour retention.

Emulsions/Dispersions:

These formats are used for easy miscibility and protect hydrophobic pigments in bakery matrices. These systems can be tailored to withstand baking conditions and maintain colour uniformity throughout the product.

A Rainbow of Natural Colours to have delightful vibrancy

Reds- Beet juice Colour provides excellent pink & red velvet shades in bakery applications but degrades at temperatures 70-80°C due to browning under heat processing.

For lower heat bakery applications, low strength beetroot Colour is more suitable, however for high heat applications like cakes, muffins, cookies, beetroot pigment has been stabilized through advanced processing technologies to make them stable and provide vibrancy.

Orange- Carotenoids/beta carotene (veg), annatto all delivers yellowish orange to golden orange hues and are heat stable options for bake stable products. Annatto pigments vary in stability Bixin oil soluble is less stable than norbixin (water soluble) and if formulated properly performs better in baked products.

Yellow- Turmeric Colour provides the brightest yellow and a very heat stable option, but it fades under light exposure, so it isn't a great option in clear packaged baked items. Another yellow option in carotenoids & beta carotene (veg) due to its good heat and light stability with vibrant golden yellow hue.

Blue/Purples- Natural blue shades are challenging to achieve in baking applications, Phycocyanin from Spirulina is sensitive to heat and acidic pH, however with proper encapsulation technology,they can provide a good blue shade in bakery products. Anthocyanin (black carrot) can be stabilized for bakery applications through proper buffering and encapsulation technique providing a violet to purple shade.

Green- Chlorophyll's and copper chlorophyllin complex can be used singly or in combination with turmeric/curcumin/yellow carotenoids to achieve varied bright green shade, however they degrade under heat and light due to pheophytin formation. Cu chlorophyllin are more stable water-soluble pigments and can be protected by encapsulation.

Browns- Caramel (class 1 to 4) can be used for a good brown shade and are very heat stable. Caramels can also be combined with other natural stable colours (beetroot, annatto, beta carotene) to achieve different bolder shades of brown.

Synthetic Colours are petroleum-based dyes and are very stable at higher baking temperatures providing bright shades and work across a wide range of pH, however many formulators use high dosage to achieve vibrant colours and used different combination of dyes at high dosage than stipulated as per regulatory compliance.

Adulterants: In today's time it has become easier to look at replacement of synthetic colours with Natural solutions but more difficult to cater to matching an adulterated Natural colour with pure Natural solution.

Rampant adulteration in pretext of replacing synthetic colour with Natural colours at a very low cost is in practice thereby compromising health. These offer bright shades at lower dosages and do not deteriorate on heating. These may be spiked with synthetic food or non- food colour.This needs to be looked at seriously with better regulatory enforcement and vigilance.

Change over from synthetic colour to Natural colour is good for a more sustainable, clean label solution, thus making baked product premium with added health, but doing so using an adulterated Natural colour is more dangerous.

FORMULATING TO PROMOTE NUTRITION: CUTTING-EDGE INGREDIENTS AND PROCESSING TECHNOLOGIES

AUTHOR
Ms Shilpa Wadhwa,
Nestlé India

Introduction

Food is fundamental for sustenance, well-being, and fostering social connections. The importance of food processing cannot be overstated, as it encompasses various functions such as cleaning and preservation, enhancement and modification, and providing diverse consumption formats. Traditional methods of food processing have been pivotal in ensuring food safety and quality.

Nutritional Status in India

The nutritional landscape in India presents significant challenges, with alarming rates of malnutrition and lifestyle disorders. Child malnutrition remains a significant issue, with stunting, wasting, and underweight rates showing little improvement over five years.

Micronutrient deficiencies in iron, vitamin A, vitamin D, zinc, vitamin B12, and folate persist across different age groups. Chronic health conditions among adults are on the rise, with high percentages of cardiovascular diseases, hypertension, diabetes, obesity, and related issues. Addressing these issues is critical for the nation's health and economic productivity.

Nutrition in Modern Diets

Nutrition influences overall health, prevents chronic diseases, and supports well-being.

The definition of what constitutes a healthy diet is continually shifting to reflect evolving understanding of the roles of different foods, essential nutrients, food components play in health and disease.

As dietary preferences shift, understanding the role of nutrition in everyday diets becomes vital.

Kellogg's

HIGH FIBRE

HIGH IRON

6 VITAMINS

ONLY 2% FAT^

Creative Visualization. Suggested Serving. ^A naturally low fat food.

Understanding of healthy diets has evolved, emphasizing the importance of diverse foods and essential nutrients. The significance of overall dietary patterns surpasses the focus on isolated nutrients, promoting a holistic approach to nutrition.

For instance, the impact of total fat intake or specific vitamins, such as vitamin D, should be understood within the context of an individual's entire diet. Studies have shown that a balanced diet rich in diverse food groups is more beneficial for cardiovascular and metabolic health than concentrating on single nutrients. This holistic approach helps in reducing the risk of chronic diseases and promotes better health outcomes.

Formulating Products to Enhance Nutrition Quality

Product formulation can significantly improve nutrition quality in four key areas: food safety, addressing deficiencies, meeting specific nutritional needs, and accommodating food intolerances and allergies.

Food safety

Food processing is essential for enhancing food safety and extending shelf life. By removing contaminants and employing various preservation techniques, processing ensures that consumers have access to safe, nutritious, and long-lasting food products. As the processing technologies continue to evolve it will further help improve the quality and safety of the food supply, benefiting consumers worldwide.

Plant-Based and Alternative Proteins

The rise of plant-based diets, driven by vegetarian and vegan trends, is notable. There is a growing demand for plant-based protein options, which are not only nutritious but also sustainable.

Popular sources of plant-based proteins include pulses, soya, nuts, seeds, grains and peas, which offer healthy alternatives to meat.

These plant-based protein alternatives offer a sustainable and nutritious option for consumers without compromising on taste and texture. Emerging technologies play a crucial role in delivering these benefits, ensuring that consumers can enjoy a diverse range of delicious and healthful plant-based products. As the market continues to evolve, the integration of innovative ingredients and processing techniques will further enhance the appeal of plant-based nutrition.

Probiotics and Prebiotics

A probiotic is a beneficial microbial dietary supplement that positively impacts the host's health, particularly through its effects in the intestinal tract. Examples of probiotic-rich foods include fermented dairy products such as yogurt and dairy beverages, freeze-dried cultures, as well as fermented vegetable products like kimchi and pickles. These foods are known for their ability to promote gut health and enhance overall well-being.

Prebiotics, in contrast, are non-digestible food components that provide health benefits to the host by selectively promoting the growth or activity of specific bacteria in the colon. Examples of prebiotics include inulin-type fructans, hydrolyzed inulin, oligofructose, and fructo-oligosaccharides. These substances serve as food for beneficial gut bacteria, helping to enhance gut health and overall well-being.

As we look to the future, industry trends and consumer preferences are expected to continue driving the demand for the integration of probiotics, prebiotics, and other bioactive substances into food products. This shift will likely lead to the emergence of new formats that cater to diverse consumer needs and preferences, making these health-promoting ingredients more accessible and appealing.

Additionally, next-generation probiotics may be isolated from non-dairy sources, expanding options for individuals with dietary restrictions or those seeking plant-based alternatives. Alongside these developments, advancements in delivery technologies and quality assurance will play a critical role in ensuring that these products maintain their efficacy and safety.

Fermentation and Biofortification

Fermentation and germination are widely recognized processes utilized for the processing of cereals and legumes, which form a substantial part of many diets around the world.

Fermentation and germination improve the bio accessibility and bioavailability of nutrients, making it easier for the body to absorb essential vitamins and minerals. Fermentation can break down anti-nutritional factors like phytic acid in grains and legumes, which can inhibit mineral absorption which in turn not only increases the nutrient content but also enhances the digestibility of these foods.

Furthermore, fermentation and germination contribute to extending the shelf life of cereals and legumes by inhibiting the growth of spoilage microorganisms and pathogens. These methods help preserve the quality of food products for longer periods, reducing food waste and increasing food security.

Finally, these processes play a vital role in detoxifying harmful substances such as aflatoxins, which can be present in certain grains and legumes. Through fermentation, the levels of these toxins can be significantly reduced, making the food safer for consumption.

Biofortification is a strategic approach aimed at enhancing the nutrient density of food crops through various methods, including conventional plant breeding, improved agronomic practices, and modern biotechnology.

This process is designed to increase essential vitamins and minerals in crops without compromising other characteristics. Biofortified crops can be bred to retain their taste, texture, and yield while simultaneously boosting their nutritional profile and also offers a sustainable solution to improve public health.

By focusing on the nutritional quality of staple crops, biofortification not only addresses malnutrition but also supports agricultural sustainability and food security, ensuring that the benefits of enhanced nutrition reach both consumers and farmers alike.

Fermentation and biofortification are two promising techniques that enhance the nutritional value of food. Technological advancement for these processeshas shown positive impacts on nutrient density, contributing to improved health outcomes.

Traditional Ingredients in Modern Formats

Traditional food ingredients are increasingly being integrated into modern formats, creating innovative products that appeal to contemporary consumers while preserving cultural heritage. Ingredients such as whole grains, legumes, herbs, and spices are being repurposed in various ways, from ready-to-eat meals to snack bars and beverages. This fusion not only enhances the nutritional profile of these products but also caters to the growing demand for convenience and health-conscious options.

For instance, ancient grains like quinoa and amaranth are now commonly found in breakfast cereals and protein bars, while traditional spices are used to create unique flavor profiles in sauces and dressings.

Ghee and jaggery are increasingly popular ingredients used in a variety of food products, including granola bars and other snacks, to enhance flavor and provide natural sweetness. By bridging the gap between traditional food practices and modern culinary trends, manufacturers can offer products that resonate with consumers seeking both authenticity and innovation, ultimately enriching their dietary choices and promoting healthier eating habits.

Inclusion of traditional and familiar healthier ingredients not only enhances the nutritional profile of these products but also caters to the growing consumer demand for healthier and more diverse food options.

Reformulating to Reduce PHSN

Food reformulation refers to the process of modifying the composition of food products with the primary aim of developing healthier options for consumers. This can involve reducing certain ingredients, such as sugar, salt, and unhealthy fats, while enhancing the nutritional profile of the food. There are two main approaches to food reformulation: the traditional reductionist approach and the food matrix approach.

The traditional reductionist approach remains relevant in the industry due to its ability to yield quicker results. This method focuses on simply decreasing undesirable components in a product, such as lowering sugar levels in a beverage or reducing sodium content in snacks. It allows manufacturers to make immediate adjustments that can lead to healthier food options, appealing to health-conscious consumers.

On the other hand, the food matrix approach is more complex and involves engineering the microstructure of food products to improve their overall health benefits without sacrificing taste or texture. This method may take longer to implement, as it requires a deeper understanding of how various ingredients interact within the food matrix. By focusing on the holistic composition of the food, this approach aims to enhance the bioavailability of nutrients and improve the sensory experience of the product.

Both approaches for reducing the Public Health Sensitive Nutrients (PHSN) through food reformulation may help in the development of healthier food products. While the traditional reductionist method offers immediate benefits, the food matrix approach provides a more comprehensive strategy for creating nutritious and enjoyable foods that meet the evolving demands of consumers.

Processing Techniques to Enhance or Retain Nutritional Properties of Foods

The processing of food plays a critical role in enhancing or retaining the nutritional properties of various products, ensuring they deliver maximum health benefits to consumers.

Nutrient Retention

Cold-pressing is an effective processing method for retaining essential nutrients particularly beneficial for juices and oils, as it minimizes exposure to heat and oxygen, which can degrade sensitive vitamins and antioxidants.

Through this, manufacturers can ensure that the final product retains nutrients, providing consumers with maximumbenefits from their beverages and oils.

Extended Shelf Life

Another important processing technique that extends the shelf life of food products is high-pressure processing (HPP), which works by applying high pressure to food items, effectively eliminating harmful bacteria and pathogens without the need for chemical preservatives.

This method not only preserves the flavor and nutrients of the food but also enhances its safety and longevity ensuring products can remain fresh for longer periods, reducing food waste and providing consumers safe, nutritious options.

Bioactive Compounds and Microencapsulation Techniques

The exploration of bioactive compounds and microencapsulation techniques presents numerous advantages that significantly enhance the functionality and effectiveness of food products.

Bioactive compounds, which are naturally occurring substances found in various foods, can have beneficial effects on health, including antioxidant, anti-inflammatory, and antimicrobial properties.

However, these compounds can be sensitive to environmental factors such as heat, light, and oxygen, which may diminish their efficacy.

Microencapsulation is a sophisticated technique that addresses these challenges by encapsulating bioactive compounds within a protective coating. This process allows for the controlled release of nutrients, ensuring that they remain stable and effective until they reach the desired site of action in the body. By using microencapsulation, manufacturers can enhance the bioavailability of these compounds, allowing consumers to reap maximum health benefits from their food.

In summary, the integration of bioactive compounds and microencapsulation techniques into food products offers significant benefits, including improved nutrient delivery, enhanced stability, and better handling of sensitive ingredients. These advancements not only contribute to the development of healthier food options but also align with the growing consumer demand for functional foods that promote overall well-being.

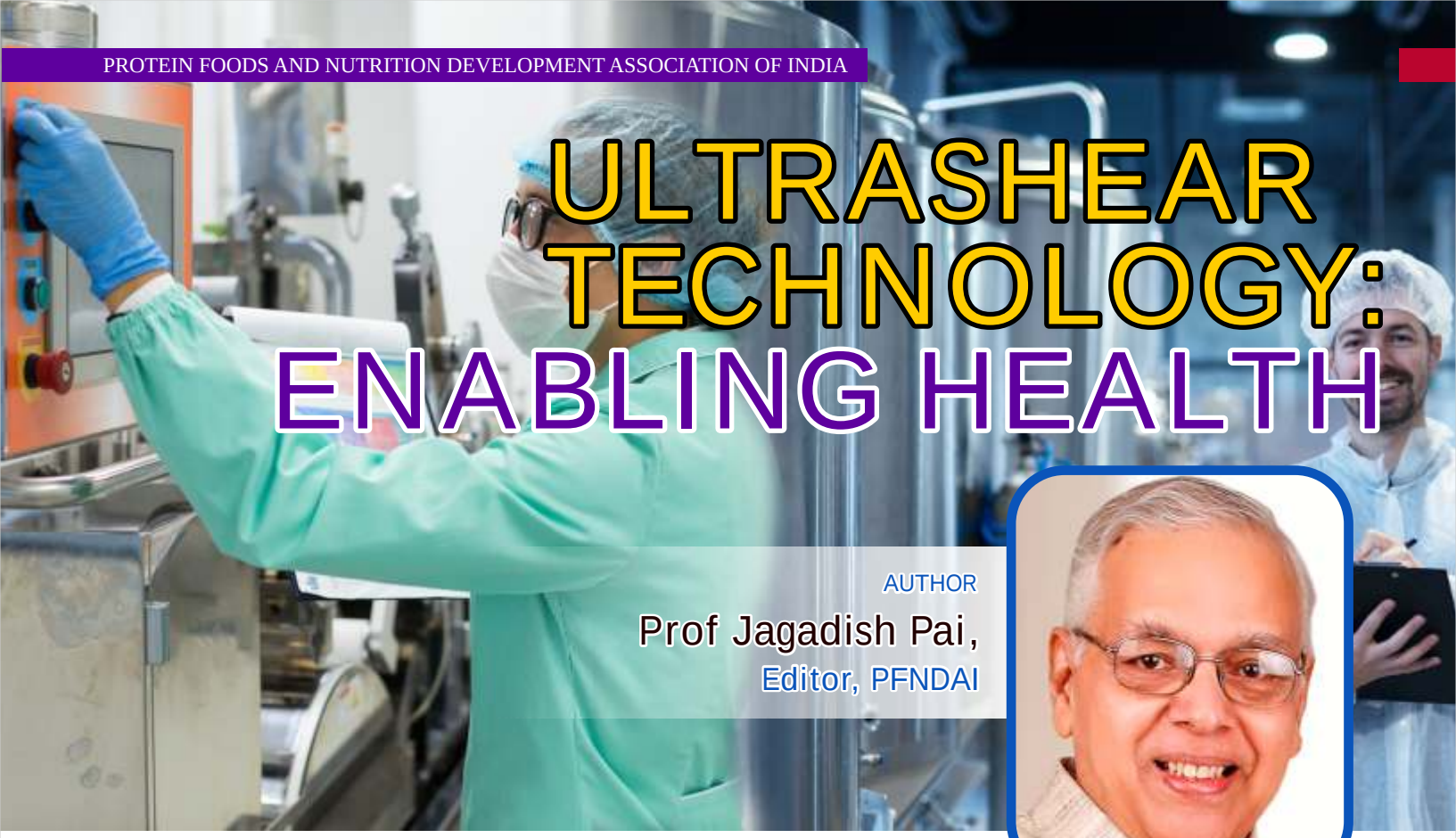
Summarizing

One of the primary goals of food processing should be to maximize nutrient retention (such as fibre, micronutrients, active compounds) and minimize nutrient loss and nutrient degradation. Processing methods should focus on maintaining the integrity of nutritional ingredients so that the final product that reaches the consumer is high quality and helps meeting their nutritional and dietary requirements.

Food processing can play a significant role in the development of personalized nutrition solutions, catering to the unique dietary needs, recommended dietary allowances, preferences of individual consumers and food intolerances or allergies. As the demand for tailored nutritional products continues to grow, there is scope for food processing techniques adapted to enhance the nutritional profile of foods while accommodating specific health goals.

Innovations in food processing are pivotal in shaping the future of nutrition. Key areas include understanding consumer needs, leveraging innovative ingredients, employing advanced processing technologies, and applying real-world solutions to improve public health.

Collaborative partnerships among food scientists, nutritionists, and manufacturers are crucial for driving innovation in the food industry. Such collaborations foster the development of new products that meet evolving consumer needs.



ULTRASHEAR TECHNOLOGY: ENABLING HEALTH

AUTHOR
Prof Jagadish Pai,
Editor, PFNDAI

Ultrashear Technology (UST) is a high-pressure technology like High Pressure Processing (HPP) but whereas HPP is a batch process, UST is a continuous process. However, while HPP can be applied to many different types of products such as meat, guacamole, seafood, ready-to-eat meals, sauces, juices & beverages, jams, salsa, pet foods, baby foods, fruits and vegetable products; UST is useful for liquid foods.

Liquids are subjected to pressure and are then passed through a shear valve. The valve may be a small gap between the seat of the valve and the ball or needle. UST treated foods may be either pasteurised or commercially sterilised depending on the pressure and the temperature of the process used, just as in HPP.

Advantages

There are some other advantages besides the retention of nutrients and original tastes and flavours along with the clean label tag; particle size reduction is achieved and viscosity is changed with material acquiring emulsification and homogenisation characteristics without the use of additives such as emulsifiers and stabilisers or thickeners. This makes pouring smoother.

UST may be similar to high-pressure homogenisers, but uses higher pressures and slightly higher temperature, which not just achieves the desired changes in the rheology but also causes destruction of microbes to render the product safe. Homogenisers fall short of the physical effects of the UST process but also need separate pasteurisation process involving much more severe thermal process. On the other hand, homogenisers handle much higher volumes than UST, but the latter has overall better precision on the final product characteristics with respect to particle size and rheology.

Technical Information

Ultra-shear technology uses 400 MPa or even higher e.g. 600 MPa pressure on liquid foods with subsequent depressurising of the treated liquid using a special shear valve.

This valve converts the high pressure into a fluid dynamic force. The shear valve has a throttle design which adjusts the flow restriction gap to ensure the material gets maximum shear rate. By adjusting the flow rate and the restriction gap distance, shear rates of 10^9 to 10^7 per second could be achieved. When the fluid passes through the valve, pressure energy is converted into kinetic energy and then heat. This results into instantaneous product temperature increase of about 18°C to 20°C per 100 MPa. This helps in minimising the deterioration of product quality and extension of shelf life.

The design of the throttle prevents clogging and ensures that all the product receives maximum shear rate possible. This prevents under-processing of any material. Making shear valve of ceramic prevents it from erosion due to rapid cavitation effect.

Applications to Foods

Process parameters are optimised such as pressure, temperature, and shear rate along with the product parameters such as pH, water activity and composition to achieve a variety of effects on the final product. Along with preservation, pasteurisation or commercial sterilisation of the liquid foods, blending of dairy & plant proteins and fats to prepare a stable colloidal dispersion could be achieved. Even nano-emulsions for rapid absorption of nutrients could be achieved by UST. Active components could be made highly bioavailable with this technology.

Researchers have shown that the combination of pressure, temperature and shear can together destroy bacterial cells and spores. While vegetative cells could easily be destroyed by milder conditions, spores need more intense treatment combinations of pressure-thermal-shear conditions. There is an advantage of shear in the process in that it breaks clumps of spores or cells of bacteria with the reduction of protective effect of clumping.

As the shear valve gaps are very small, it is not possible to process liquids with large particulate matter. However, particulate matter could be processed separately and then added to UST treated liquids during aseptic packing.

Special Benefits

High protein liquid foods normally have animal protein sources, including dairy milk, chicken and others. However, consumers are interested in including plant proteins in their diets. Beverages made from alternative sources like soy, pea and almond, however, has sedimentation problem. This leads to instability and non-homogeneity. It is possible to use additives like stabilisers and emulsifiers but the current trend of clean labels discourages use of these additives. UST can be a valuable processing tool for producing stable plant-based as well as plant-animal protein blends in dispersion without any additives. Pea or almond proteins when blended with animal proteins are elevated in their nutritional quality and such blends are becoming more popular for nutritional and environmental reasons.

Besides making foods safe, UST can also be used to modify proteins and fats into foods to contribute structural, textural and stability effects. Foods can be thickened or gelled without the use of additives. Ice cream could be prepared using UST-treated ice cream mix without any emulsifiers and stabilisers.

2 cups of Bournvita contains 50% RDA of Vitamin D, Iron and Zinc that support bones, cognitive and immune function thus supporting strength. For children (7-9 yrs.), ICMR -NIN, 2020. For more details, refer to the pack.

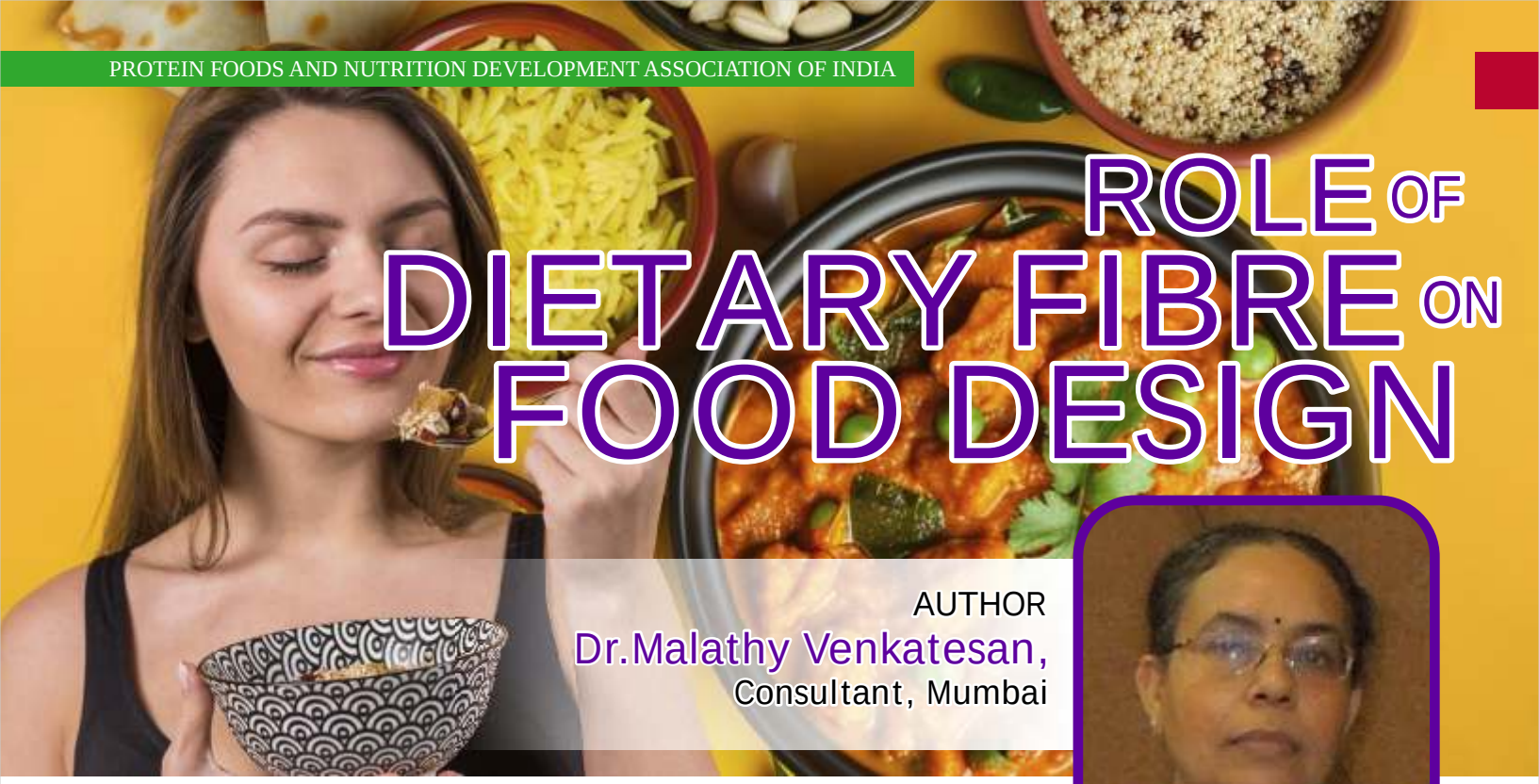
As nanotechnology is developing rapidly, special attention is received by nano-emulsions both in drug delivery and food supplements. nano-emulsion facilitate rapid absorption of nutrients. There is also increased bioavailability of active ingredients in various nutritional applications such as oral, parenteral etc. Nano-emulsions with droplet size less than 100 nm have been shown to have stability. For nano-emulsion preparation, initial coarse emulsions are prepared using homogenisers and then it is subjected to UST treatment. Nano-emulsions of curcumin, astaxanthin, prednisone, algae and neem oil have been demonstrated that withstand room temperature and freeze-thaw cycles.

Commercial Prospects

High pressure processing (HPP) has been used for some time now a multi-billion-dollar industry and growing. However, it has limitations of being a batch process. At least for some liquid preparations of foods and supplements, there is a continuous process namely UST available that has shown tremendous promise of commercial future. It has the limitation of being applied only for liquids but it has some additional advantages over HPP. Its shear can give additional effectiveness to remove the clumps of bacteria making them more vulnerable to the UST process. Also in some cases, it can improve the absorption of nutrients and bioavailability of components by making nano-emulsions. In many new formulations it has shown benefits in providing textures without the use of additives making it highly desirable in present consumer demand. While UST is not commercially practiced today, the technology has the potential to create various clean-label liquid foods, emulsions, saucesand supplements.

References

Janahar et al. (2022) Impact of ultra-shear technology on quality attributes of model dairy-pea protein dispersions with different fat levels - ScienceDirect
Food Engineering (2021) Shear technology uses homogenization and ultrahigh pressure to improve quality, kill bacteria | 2021-06-25 | Food Engineering
Ohio State installs, commissions new pilot-scale ultra-shear technology equipment for liquid foods and beverages processing | FST
Janahar et al. (2021) (PDF) Effects of pressure, shear, temperature, and their interactions on selected milk quality attributes
Balasubramanian et al. (2023) Ultra-shear: A Transformative Technology - IFT.org
Guduru et al. (2024) (PDF) Impact of thermal, high-pressure and ultra-shear pasteurisation technologies on beetroot juice metabolites using untargeted nuclear magnetic resonance spectroscopy
Podolak et al. (2020) Factors Affecting Microbial Inactivation during High Pressure Processing in Juices and Beverages: A Review - ScienceDirect



ROLE OF DIETARY FIBRE ON FOOD DESIGN

AUTHOR
Dr.Malathy Venkatesan,
Consultant, Mumbai

Introduction:

Dietary fibre is that part of plant material in the diet which is resistant to enzymatic digestion which includes cellulose, non-cellulosic polysaccharides such as hemicellulose, pectic substances, gums, mucilages and a non-carbohydrate component lignin. The diets rich in fibre such as cereals, nuts, fruits and vegetables have a positive effect on health since their consumption has been related to decreased incidence of several diseases. Dietary fibre can be used in various functional foods like bakery, drinks, beverages and meat products. Influence of different processing treatments (like extrusion-cooking, canning, grinding, boiling, frying) alters the physico- chemical properties of dietary fibre and improves their functionality. (1)

The importance of food fibre has led to the development of a large and potential market for fibre-rich products and ingredients and in recent years, there is a trend to find new sources of dietary fibre that can be used in the food industry.

Technological functionality of dietary fibre

Dietary fibre components, isolated from native plants, provide many functional properties that affect technological attributes of foods. Dietary fibre is classified as water-soluble or insoluble (table 1) and has the corresponding functional effect on the food product. These functional properties also influence the behaviour of the food product during its processing as well as its final quality and characteristics.

One of the most important technological properties of dietary fibre is to bind water. Water holding capacity (WHC) is dependent on the fibre source. Soluble fibres, such as pectin and gums, possess a higher WHC than cellulosic fibre, whereas the hydrophobic nature of lignin depresses water binding capacity. Powdered fibres that are fundamentally cellulosic, such as grain husks, bind several times of their weight in water. Some researchers reported that the hydration properties of dietary fibre are enhanced by grinding that increases its affinity to entrap water

Table 1. Classification of dietary fibre components based on water solubility/fermentability (1)

Characteristic	Fibre Component	Description	Main food sources
Water insoluble/ Less fermented	Cellulose	Main structural component of plant cell wall. Insoluble in concentrated alkali, soluble in concentrated acid.	Plants (vegetables, sugar beet, various brans)
	Hemi-cellulose	Cell wall polysaccharides, which contain backbone of β-1, 4 glucosidic linkages. Soluble in dilute alkali.	Cereal grains
	Lignin	Non-carbohydrate cell wall component. Complex cross-linked phenyl propane polymer. Resists bacterial degradation.	Woody plants
Water soluble/ Well fermented	Pectin	Components of primary cell wall with D-galacturonic acid as principal components. Generally, water soluble and gel forming	Fruits, vegetables, legumes, sugar beet, potato
	Gums	Secreted at site of plant injury by specialized secretary cells. Food and pharmaceutical use.	Leguminous seed plants (guar, locust bean), seaweed extracts (carrageenan, alginates), microbial gums (xanthan, gellan)
	Mucilages	Synthesized by plant, prevent desiccation of seed endosperm. Food industry use, hydrophilic, stabilizer	Plant extracts (gum acacia, gum karaya, gum tragacanth)
	Fructo-oligo-saccharides (FOS)	Prebiotic, sweetener, bulking agent, and humectant	naturally occurring in onions, chicory, fermentation of sucrose
	Dextrin	thickener, fat replacer, texture modifier, stabilizer	Processing of starch using enzymes, heat, acid treatment

Viscosity is another important technological property of fibres that provides rheological characteristics to food systems. Soluble dietary fibre(SDF) becomes viscous when mixed with water. Examples are fibres, such as pectin, gums, β-glucans form highly viscous solutions.

Dietary fibre is also used in formulations for its capacity to form gels, due mainly to the soluble fibre components such as pectin, gums, and mucilage. Gel formation depends on the type of gum, its concentration, temperature, presence of ions (e.g., calcium), pH, and the presence of other rheological modifiers in the food system. Many types of fibres possess ion-binding property; The fibre carrageenan extracted from sea weeds is an example. Potassium and calcium ions interact with carrageenan through electrostatic forces to form a stable gel.

Other dietary fibres have capacity to also bind cations such as cadmium, iron,zinc, and copper. One of the benefits of these fibres is binding to pro-oxidant ions that are involved in catalysing lipid oxidation reactions. It has also been reported that some dietary fibres (example wheat bran) absorb organic molecules which associates with bile acids and also interacts the potential carcinogens such as benzopyrazine.(1)

TRY

Saffola Oats

Soft & Creamy Oats

Creative Visualization. $Based on Kantar Household Panel data.
For more details please visit https://saffola.marico.in/; www.marico.com

Fructo-oligosaccharides and resistant dextrin are dietary fibres with mild sweet taste, prebiotic effects, effective as fat replacers.

Functional roles in product design

Textural modification:

Thickening and gelling: Soluble fibres, such as pectin, guar gum, and -β glucans form viscous gels in the presence of water. This property is used to thicken beverages, sauces, gravies, and soups, and to create the gel-like texture in jams, jellies, and desserts. The use of fibre from legumes, fruits and psyllium husk as gelling agents are recent advances.

Structural enhancement:

Insoluble fibres like cellulose and wheat bran can improve the structure of baked goods such as bread and muffins. They add strength and body, which can be particularly useful in gluten-free products to compensate for the lack of gluten's binding network. To date, the most common sources of dietary fibre in bakery products are bran or whole-grain flour from various cereals and pseudo-cereals, but lately, other sources including fruits and vegetables, as well as legumes and pulses are emerging. Additionally, the addition of dietary fibre in bakery products has been remarkably reported to impact dough properties and gluten network formation which are key factors controlling end-product, consequently, changing the rheology, texture, and organoleptic quality of the bakery product.(2)

Binding and cohesion: Meat is a rich source of high biological proteins, vitamins, and minerals, but it is devoid of dietary fibre. In comminuted meat products and plant-based meat alternatives, dietary fibres act as binders. They help form a stable structure, improve cohesion, and reduce cooking loss.

In a study rice flour and barnyard millet flour was used in the development of dehydrated chicken meat rings. The authors reported a lower dehydration ratio and higher yield percentage in the treated meat rings than the control. Oat bran and oat flour are well known as sources of soluble dietary fibres. When used in meat products, the benefit of lowering the serum cholesterol level is an advantage to the consumer. They also help to reduce the absorption of fat and carbohydrates in the human gastrointestinal tract and aid satiety.

Similar application of fructo-oligosaccharides as fat replacer in meat showed that the sensory and textural properties and the overall acceptability were very good

Examples of influence of dietary fibre on textural properties of meat products is listed in table 2.(3)

Table 2: Influence of dietary fibre on textural properties, colour parameters, and sensory properties of meat products (3)

Source of fibre	Meat product	Optimum level of incor-poration	Changes in attributes
Corn, oats, and rye bran	Turkish meatballs	10%	Higher yellowness value Lightness increased and redness decreased
Inulin	Chinese style sausages	3.5%	No significant difference
Inulin	Chicken meat balls	3%	Colour values increased
Chia flour	Chicken nuggets	10%	Cohesiveness, springiness, lightness, yellowness value, and redness value increased

2. Nutritional enhancement

Fiber fortification:

Designers can increase a product's fibre content to make it a "source of fibre" or "high in fibre." Fortification is common in cereals, baked goods, snacks, and dairy products like yogurt. Fructo-oligosaccharides are used in yogurt as a prebiotic and improve the growth of starter cultures.

Fat and sugar replacement:

Certain fibres, such as inulin and polydextrose, can replace fat and sugar in low-calorie products without compromising texture or mouthfeel. They can mimic fat's creaminess in dairy products and add bulk in baked goods, reducing the overall caloric density. Resistant dextrin, with its slightly sweet taste and low caloric properties, is also utilized in producing sugar-free functional beverages.

Reduced glycemic load:

Soluble fibres such as fructo-oligosaccharides can slow the digestion and absorption of carbohydrates, which helps stabilize blood sugar levels. This effect is used in products designed for diabetes management or for those seeking slow-release energy, such as certain cereals and supplements.(4) Oat fibre can be incorporated into milk shakes, instant type-breakfast drinks, fruit and vegetable juices, ice tea, sports drinks, cappuccino and wine. Other beverages that can benefit from the addition of fibre include liquid diet beverages- both those created for people with special dietary needs as well as weight loss or meal- replacement beverages.(1)

FOS can act as a humectant in food products, which means they help retain moisture and prevent products from drying out. They can be particularly useful in baked goods and other products where moisture retention is important for texture and shelf life.

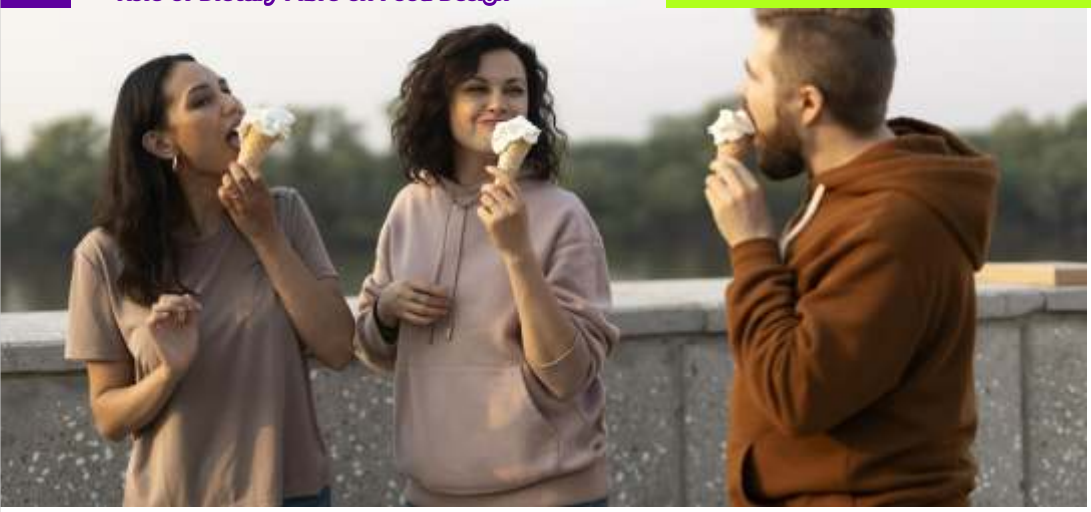
Resistant dextrin, with its slightly sweet taste and low caloric properties, is also utilized in producing sugar-free functional beverages.

3. Quality and stability

Soluble dietary fibres serve as stabilisers and emulsifiers in the food industry and play a key role in improving the texture, stability, and quality of various food products. They help create even mixtures, prevent ingredient separation, and enhance the sensory experience of food. Common uses of soluble dietary fibre as a stabilising and emulsifying agent can be found in beverages, dressings, sauces, dairy products, sweets, baked goods, meat products, plant-based meat substitutes, gluten-free foods, and soup and sauce mixes, particularly in low-fat and reduced-calorie offerings. For example, xanthan gum and guar gum are commonly used to prevent oil and water from separating.

Use of soluble dietary fibre helps maintain freshness and extends the shelf life of baked goods and processed meats by improving their moisture retention.
In yogurt and other dairy products, fibres like pectin can help control texture and prevent syneresis (the separation of liquid from the gel).

For pastas, the anti-sticking characteristics of certain fibres of oats, barley, soy, rice bran etc. help to facilitate the extrusion process and may also contribute to dough strength or improves steam table life of the cooked pasta. Addition of gums to certain Asian noodle products make the noodles firmer and easier to rehydrate upon cooking or soaking (5)



Addition of 5 and 8% of inulin, FOS syrup and chicory flour to gluten free bread reduced the crumb hardening rate during the 3 days storage period studied.

Impact on sensory properties:

Taste and texture: The choice and concentration of fibre significantly impact a product's sensory attributes. Some fibres can affect mouthfeel, while an excessive amount of insoluble fibre can create a gritty or unpleasant texture. The particle size of wheat bran had a significant relation with texture properties, cooking loss, and evaluation score of noodles. As the particle size of the bran was decreased, the hardness and cooking loss of noodles decreased significantly with relative increase in sensory scores. (5).

Yogurt fortified with 3% date fibre resulted with similar sourness, sweetness, firmness, smoothness and overall acceptability as the control yogurt. Acceptable quality fibre fortified misti doi could be prepared using inulin and soy fibre at 1.5 % level of fortification.(6) In another study inulin and acacia fibres samples showed a sensory profile comparable to the full-fat ice cream for nearly all attributes.(7)

Application of resistant dextrin has been shown to significantly decrease the surface tension of dissolved substances, thereby modifying the sensory characteristics of rice wine and red wine and improving their taste and stability.(8)

Flavour and colour: The source of the fibre can impart its own flavour and colour, which must be considered. For example, some fruit-derived fibres may add a subtle flavour, while others can darken the product.

It has been observed that the crust of wheat rolls tends to be browner with a higher content of dietary fibre. Wheat rolls with high dietary fibre underwent a colour change due to an oxidation reaction and sugars participated in caramelization during baking. This could be preferred since golden brown crust and creamy white bread crumb are the most important appealing factors to indicate the quality of a bakery product to consumers. (2)

However, the effect of the addition of barley fibre preparations to medium-grounded canned meat products caused a significant darkening and an increase in the proportion of yellow colour. (3)

Commercially, this may result in poorer consumer acceptance of the meat product. The effect of fibre on colour of ice cream was studied. Ice creams fortified with inulin and acacia showed no significant difference from full-fat ice cream.

However, the oat and apple fibre variants exhibited higher b* values, mainly due to an increase in yellowness. This noticeable shift in colour can be attributed to the inherent coloration of the fibres themselves. Oat fibre tends to lean towards a yellow hue, whereas apple fibre tends towards red, in contrast to the white appearance of inulin and acacia.(7)

Summary

Dietary fibre can be used in various foods like bakery, drinks, beverages and meat products and enhance their functional properties. Fibre in foods can change their consistency, texture, rheological behaviour and sensory characteristic of the end products. The importance of food fibres has led to the development of a large and potential market for fibre-rich products and ingredients and in recent years, there is a trend to find new sources of dietary fibre that can be used in the food industry. The emergence of novel sources of fibres, have been offering new opportunities in their use in food industry.

References

1: Dhingra et al. (2012) Dietary fibre in foods: a review; J Food Sci Technol, 49(3):255–266 DOI 10.1007/s13197-011-0365-5

2: Kurek M,& Wyrwisz J (2015) The Application of Dietary Fiber in Bread Products. J Food Process Technol 6: 447. doi:10.4172/21577110.1000447

3: Mishra et al. (2023),Properties and physiological effects of dietary fiber-enriched meat products: a review;Front Nutr., 10:1275341. doi: 10.3389/fnut.2023.1275341

4:Khanvilkar, S. S. and Arya, S. S. (2015),Fructo-oligosaccharides: applications and health benefits. A review; Agro FOOD Industry. Hi Tech, 26 (6), 8-12

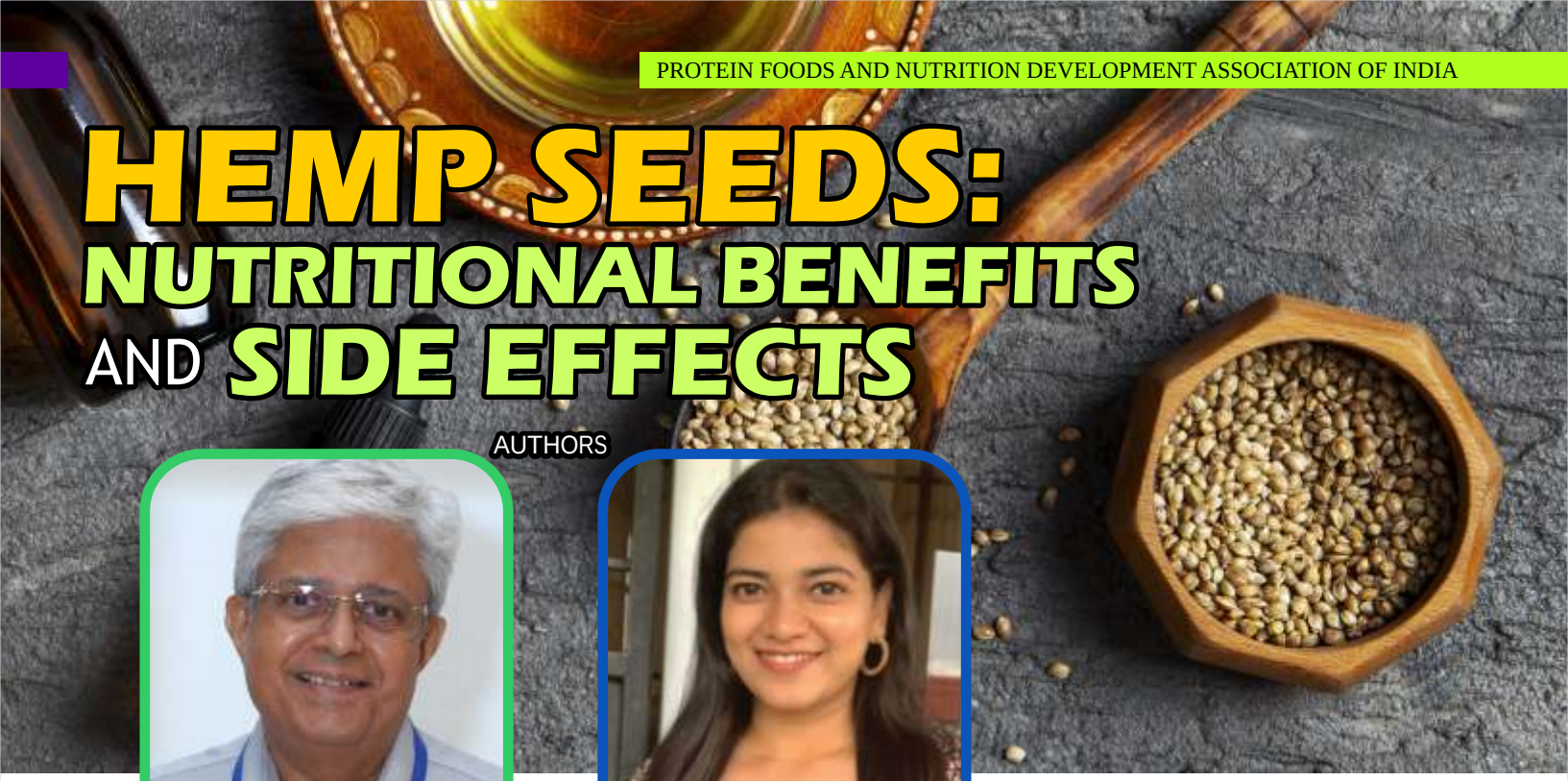
5: Zhang et al. 2019), Effect of wheat bran insoluble dietary fiber with different particle size on the texture properties, protein secondary structure, and microstructure of noodles; Grain & Oil Science and Technology 2, 97–102

6: Raju P.N., and Pal D., (2014), Effect of dietary fibers on physico-chemical, sensory and textural properties of Misti Dahi; J Food Sci Technol., 51(11):3124–3133 DOI 10.1007/s13197-012-0849-y

7: Tolve et al. (2024) Dietary fibers effects on physical, thermal, and sensory properties of low-fat ice cream: LWT 199, 116094

8:Wu et al. (2024), An In-Depth Overview of the Structural Properties, Health Benefits, and Applications of Resistant Dextrin; Journal of Food Processing and Preservation, 1-14, https://doi.org/10.1155/2024/8055063

HEMP SEEDS: NUTRITIONAL BENEFITS AND SIDE EFFECTS



AUTHORS

Dr Ashish Bhobe & Ms Simran Vichare,

Experienced R&D Leader, Innovation Strategist in Food Start-up and Mentor

Nutritionist, PFNDAI

Hemp seeds are quickly gaining recognition as one of the most versatile superfoods of the 21st century. These edible seeds come from the *Cannabis sativa* plant. Although they belong to the same species as marijuana, hemp seeds contain only trace amounts of THC (tetrahydro-cannabinol), the psychoactive compound. This means they do not cause any mind-altering effects. Instead, these tiny seeds are nutrient-dense, sustainable, and increasingly used in food, wellness, and even skincare industries.

Historical Roots:

With roots in ancient civilizations, hemp seeds have an interesting history. Records show that hemp seeds were utilized in ancient China and India for both culinary and medicinal purposes. Traditional Chinese medicine prescribed them for digestion and energy. In India, Hemp seeds were valued in Ayurveda for their nutritive properties and believed to balance body energy. Because of the fibrous nature of the plant, hemp seeds were used to make textiles, ropes, and even paper in addition to being used as food. Over time, stigma around cannabis restricted hemp cultivation in many regions. However, with renewed scientific interest and clarification on its non-psychoactive nature, hemp is now globally recognised. Throughout history, the hemp plant's and its seeds' adaptability has been essential to community support and the growth of several industries.

Physical Characteristics

Hemp seeds are small, oval, and typically brown to pale grey in colour, measuring 3–4 mm in length. They have a hard outer shell with a creamy, soft interior. They have small marks on the outer surface, and their nutty aroma and mildly sweet flavour make them versatile in recipes ranging from smoothies to baked goods. The hard outer shell requires cracking or processing to access the soft, edible interior.

OUR OFFERINGS

nutricircle

Kangni
(Foxtail)
Get the best of protein nutrition for better performance and health

AFTER AIR CLASSIFICATION
- **Protein Fraction 24.24%**
- Starch Fraction 14.69%

Rajgiri
(Amaranth)
The smartest way to consume the goodness of Amaranth protein

AFTER AIR CLASSIFICATION
- **Protein Fraction 31.73%**
- Starch Fraction 14.69%

Rice
Rice Protein Concentrate can be used to generate high value-added proteinaceous products.
- **Rice Protein Concentrate 80%**

Mung Beans
(Blackgram)
The natural goodness of Mung beans. Enjoy high concentration of protein isolate.

AFTER AIR CLASSIFICATION
- **Protein Fraction 39.38%**
- Starch Fraction 14.77%

Masoor Dal
(Orange Lentil)
High functional protein that also helps metabolism

AFTER AIR CLASSIFICATION
- **Protein Fraction 45.03%**
- Starch Fraction 17.69%

Kala Chana
(Horse gram)
Enjoy the miracle benefits of horse gram protein

AFTER AIR CLASSIFICATION
- **Protein Fraction 44.74%**
- Starch Fraction 13.93%

Rajma
(Kidney Beans)
The perfect plant-based protein source

AFTER AIR CLASSIFICATION
- **Protein Fraction 46.07%**
- Starch Fraction 12.71%

Nutricircle Ltd.
5-8-272, Ayesha Residency, Opp. City Convention Centre, Public Garden Road, Nampally,
Hyderabad - 500 001 | Phone: +91 9030528805 | Email: info@nutricircle.in

To know more visit us at www.nutricircle.in

Nutritional Significance of Hemp Seeds

With an increasing need for protein consumption and growing awareness about wheat, soy, and dairy allergies, and the desire to limit meat consumption among the global population, there has been a significant shift in consumer food preferences. This has led to an increase in exploring more vegan and vegetarian options for providing good-quality protein and nutrients. Here, hemp (Cannabis sativa L.) stands out as an attractive option because it provides high-quality protein while rarely triggering food allergies (1).

Traditionally, industrial hemp has been cultivated for textiles in many Asian countries. Today, it is gaining attention for its nutritional, economic, and social value. Hemp seeds are often termed a superfood because of their unique nutrient profile:

- Rich in essential fatty acids: High in polyunsaturated fatty acids (linoleic acid, alpha-linolenic acid). Omega-3 and omega-6 support brain function, heart health, and inflammation control.
- Complete plant protein: Hemp seeds provide all nine essential amino acids, making them an excellent protein source for muscle growth, immune support, and repair.
- Wide culinary use: Available as whole seeds, shelled seeds (hemp hearts), or processed into hemp milk, oil, and protein powders.

Key Health Benefits

- Complete Plant-based protein- Hemp seeds contain all nine essential amino acids, making them a complete protein source—something rare among plant foods. Their two main proteins, edestin and albumin, are highly digestible and bioavailable. This makes hemp a strong competitor to soy and whey protein.
- Heart health & Brain health: Rich in polyunsaturated fatty acids (PUFAs), hemp seeds have an ideal omega-6 to omega-3 ratio (3:1). This supports in reducing inflammation, improving cardiovascular health, as well as brain and eye development.
- Digestive Health: Whole hemp seeds (with shell) are an excellent source of dietary fibre. Fibre promotes satiety, supports gut microbiota, and prevents constipation.
- Skin & Hair Benefits: Hemp seed oil is often used in skincare for its hydrating and anti-inflammatory properties. Regular consumption may also support skin health from within.
- Hormonal Support: The gamma-linolenic acid (GLA) in hemp seeds may help regulate hormones, particularly in women experiencing PMS or menopause symptoms.
- Metabolic & Weight Management: With high-quality protein and healthy fats, hemp seeds increase satiety, reduce overeating, and may support weight control.
- Bioactive compounds like polyphenols and terpenoids are also present in hemp which provides antioxidant, antimicrobial, and anti-inflammatory benefits.

Nutritional value of whole Hemp seeds per 100 g-

Nutrients	Hemp seeds
Calorie (k/cal)	567
Proteins (g)	30
Fats (g)	50
CHO (g)	10
Vit E (mg/100g)	1
Vit D (mg/100g)	0.1
Vit B1 (mg/100g)	1
Vit B2 (mg/100g)	1.1
Vit B3 (mg/100g)	2.5
Vit B6 (mg/100g)	0.3
Ca (mg/100g)	70
Fe (mg/100g)	8
P (mg/100g)	1667
Mg (mg/100g)	700
Zn (mg/100g)	10
K (mg/100g)	1200
Cu (mg/100g)	1.6

Challenges and Considerations

Antinutritional factors: Certain compounds may reduce nutrient absorption. Hemp has a number of anti-nutritional, allergic, and off-flavour properties. Protein modification can enhance the flavour and chemical behaviour of oilseeds and their by-products used for human nutrition, but these substances have a direct impact on their acceptability worldwide.

Heat treatment and other processing methods are frequently used to reduce these unwanted substances. The inherent risk of contamination in the finished product is one of the main reasons why hemp products are not widely manufactured.

Phytic acid found in hemp seeds can bind to minerals like calcium, iron, zinc, and magnesium and reduce their bioavailability, this can be reduced by soaking, sprouting or germinating the seed first. Trypsin inhibitors and tannins can interfere with protein digestion by inhibiting trypsin and binding to proteins but this generally is reduced by heat treatment.

Lectins and saponins are also found in varying concentrations in hemp and greatly reduce the availability of protein by either precipitating it or by blocking digestion enzymes.

However, because they affect the nutritional and sensory qualities of the new product, other anti-nutritional components such low-molecular-weight phenolic compounds, polyphenolic tannins, enzyme inhibitors, phytates, and phytic acid must be taken into account when developing food products (2).

- Heavy metals: Due to hemp's phytoremediation property, it can absorb pollutants from soil. Cultivation must be carefully monitored as it can be risky for food and supplement use if grown in contaminated areas.

- THC (tetrahydrocannabinol) regulation: Only approved strains with < 0.3% THC are legally cultivated for food use as it is a psychoactive compound in cannabis. Care must be taken while cultivation as improper cultivation or cross-pollination with high-THC cannabis can raise THC levels. Also, food and supplements must meet regulatory thresholds to avoid psycho-activity or legal issues.

Factors influencing THC levels in hemp are cultivars, growing conditions, pollinating and processing methods, and also harvest timings. Therefore, one should always ensure THC compliance in Hemp products. Understanding the source from compliant growers, testing throughout the supply chain, always checking COAs (Certificate of Analysis) and monitoring local regulations is mandatory.

Common Hemp-Based Products:

Products made from hemp protein, meal, and seeds are easily accessible on the international market in a variety of combinations. Its adaptability allows hemp to be eaten raw as hemp hearts (seeds) or processed as flour, meal, oil, and powder. But the biggest influence is when hemp is used as a co-ingredient in different food products, increasing their nutritional content and demonstrating a strong functional potential.

Hemp stands out as a particularly suitable food ingredient for the functional food industry. This is related to its remarkable nutritional value and the variety of health advantages it provides.

Industrial hemp is being used by producers to make yogurt, snack bars, cookies, bread, pasta, milk, butter, ice cream. Hemp seed can be also processed and manufactured into high-moisture meat analogues and hemp milk. Beyond Meat, tofu, and other novel or functionally improved products.

- Hemp milk- Used as a non-dairy alternative, rich in protein. A high-quality and nutritious hemp milk was developed from seeds. Such milk contains about 25–30% protein and 35% fatty acids, with an optimum essential omega-3 and omega-6 fatty acid content.
- Hemp oil- Cold-pressed oil for cooking and skincare. Drizzle hemp oil on salads, oatmeal, yogurt (avoid frying, as it loses nutrients at high heat). Hemp oil is also used in moisturizers, shampoos, and serums.
- Cheese substitutes- Dairy-free alternatives made from hemp.
- Protein powders and supplements- A good plant-based supplement for athletes and vegans. Can be added to smoothies too
- Hemp seeds can be added to baked goods, granola bars, or energy balls.

Pet Food products:

In recent years, hemp has gained popularity in the pet food sector and is being utilized to enhance pet health in a variety of ways, including hemp seeds, hemp oil, and hemp protein. As a source of vital nutrients and a possible treatment for common health conditions including inflammation, digestive discomfort, and anxiety, hemp provides a variety of nutritional advantages for pet food.

Hemp plants are a beneficial addition to the pet's diet since it has omega-3 and omega-6, proteins, vitamins and minerals. As a rich source of essential fatty acids, hemp oil can be added to animal feed combinations, and hempseed and hempseed cakes can be fed to animals as sources of protein and fat (3).

Hemp-derived products are generally legal and widely accepted for use in pet foods. But the use of CBD in the products is not acceptable in many countries as the FDA has not yet provided clear guidelines on CBD (a non-psychoactive compound in hemp)in pet food, though it is commonly used in treats, oils, and capsules. Pet food manufacturers often rely on the GRAS (Generally Recognized as Safe) status of hemp seeds and oil.

Sustainability:

Hemp is not only a nutritious and versatile crop but also eco-friendly:

- Grows quickly (3–4 months) with minimal pesticides.
- Improves soil health and is used for phytoremediation (absorbing toxins).
- Requires less water than soy or almonds.
- Hemp cultivation reduces carbon footprint as it absorbs large amounts of Co2.

Thus, hemp is both a nutritional and environmental solution, aligning with global sustainability goals.

Hemp Vs Other Super Seeds:

Seed	Protein	Omega-3	Fiber	Advantage
Hemp seeds	High (complete)	Yes	Moderate	Easily digestible protein
Chia seeds	Moderate	Yes	Very high	Excellent fibre source
Flaxseeds	Moderate	Yes	High	Lignans (antioxidants)
Quinoa	High (complete)	Minimal	Moderate	Grain+pulse combo

Hemp seeds stand out for their protein quality and digestibility, making them especially valuable for vegetarians and vegans.

Safety and Precautions

Hemp seeds, protein, and oil are generally safe when consumed as food. There is insufficient credible data to determine the safety of hemp flowers, hemp leaves, or oil derived from the flower or leaf, as well as any potential negative effects. However, there are some important precautions (4):

Pregnancy and breastfeeding: Lack of sufficient evidence, better to consult first.

Allergy risk: Individuals allergic to cannabis may also react to hemp.

Blood pressure: Hemp seed protein may lower blood pressure due to increased nitric oxide production.

People undergoing surgery should stop consumption at least two weeks prior (5).

Long-term safety: Limited data available on high-dose or chronic use.

Conclusion

Hemp seeds are a nutrient-dense superfood offering a rich blend of protein, healthy fats, vitamins, and minerals. With historical roots and modern applications, they continue to gain popularity in health-conscious diets. However, mindful consumption is important, especially for sensitive groups such as pregnant women, people with allergies, or those with blood pressure concerns.

References:

1) https://pmc.ncbi.nlm.nih.gov/articles/PMC11085560/#abstract1

2) https://pmc.ncbi.nlm.nih.gov/articles/PMC11085551/#sec2-plants-13-01195

3) https://pmc.ncbi.nlm.nih.gov/articles/PMC8712657/#s5

4) https://www.webmd.com/vitamins/ai/ingredientmono-1605/hemp#precautions

5) https://pmc.ncbi.nlm.nih.gov/articles/PMC7256118/#:~:text=What%20is%20already%20known%20about,in%20populations%20with%20cardiovascular%20disease

REPORT ON THE WEBINAR ON 'THE SCIENCE OF SWEETNESS: BALANCING INDULGENCE AND HEALTH'

NAA Report by
Ms Anuja Padte,
Food Scientist, PFNDAI

PFNDAI in collaboration with Mondelez International organized webinar on 'The Science of Sweetness: Balancing Indulgence and Health', 25th August 2025.

Welcome address of Dr. Shashank Bhalkar, Executive Director, PFNDAI was focused on the importance of the webinar, which was held on the topic of "The Science of Sweetness: Balancing Indulgence and Health," sponsored by Mondelez International.

He highlighted the timeliness of the event, given the growing global concerns about sugar consumption. He traced the human relationship with sweetness from its evolutionary roots as a source of energy to its current role in processed foods and the associated health issues like dental caries and non-communicable diseases.

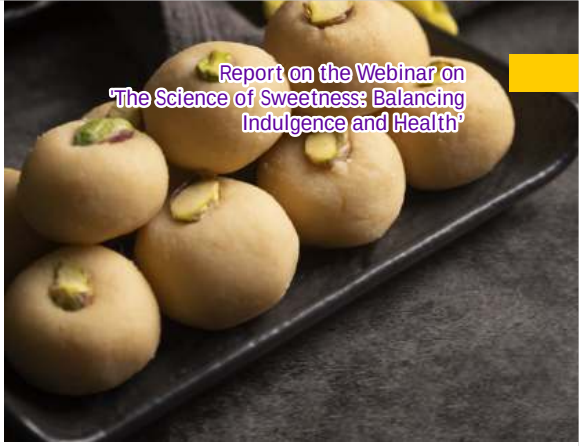
He also mentioned how food manufacturers are responding with innovations in reduced-sweetness products, and how regulations are helping consumers make informed choices.

The address concluded with an expression of confidence that the webinar would emphasize the cultural importance of sweets while promoting mindful eating and portion control. He ended by thanking Mondelez International for their sponsorship.

Ms Dolly Soni, Marketing & Project's Manager at PFNDAI greeted and introduced each of the speakers.

The session started with the presentation by Dr. Sesikeran B., former Director, ICMR-NIN. He discussed "the physiology and psychology of sweetness", explaining how the brain and taste receptors respond to sweeteners and noting that low-calorie sweeteners are a safe and effective substitute for sugars.

He explained that the human brain has evolved to link sweetness with energy, while bitterness is associated with poison.



The presentation detailed the biological pathways involved in taste perception, from taste receptors to specific brain regions like the gustatory cortex and amygdala. It also highlighted the role of early childhood exposure in shaping adult sweet preferences and concludes that low-calorie sweeteners are a safe and effective tool for reducing sugar intake, citing studies that show they do not negatively impact health markers in diabetics.

Ms. Nirmala Metwal, Lead Consumer Science, Mondelez International presented on the "Consumer Perception of Sweetness in India" where she highlighted that in India, sweetness is more than just a taste; it's a cultural and psychological experience. Indian consumers associate sweetness with emotions like joy and comfort, and with celebrations.

The presentation explored the "sugar paradox," where people desire sweet foods for their mood-boosting effects but also feel guilty about the health implications. It notes a growing trend towards "guilt-free" indulgence, with many consumers willing to pay a premium for healthier alternatives that satisfy their craving for sweetness.

Ms Shipra Sehgal, Manager, Scientific Affairs, SARA, Mondelez International presented on "Decoding Food Labels: Navigating Sweeteners". Ms. Shipra's presentation served as a guide to understanding food labels in India, with a specific focus on sweeteners. It emphasized that both regulators and food companies are responsible for providing accurate and clear product information to help consumers make informed choices.

The document outlined key labelling components, including the ingredients list, nutritional information, and various claims. It details specific regulations for sweeteners, such as warnings for products containing polyols or non-caloric sweeteners and defines the conditions for claims like "No Added Sugar" and "Zero Sugar." The presentation makes it clear that decoding these labels is crucial for making smart food choices.

The last presentation was by Dr Eram Rao, Professor, Department of Food Technology, BCAS presented on, "The Future of Sweetness: Innovations in Healthy Sweeteners," explored the growing demand for sugar alternatives driven by health concerns like obesity and diabetes, as well as consumer preferences for "clean label" and "natural" products.

The presentation highlighted market drivers such as increasing health awareness and the rise of plant-based lifestyles, while also noting restraints like stringent regulations and consumer distrust of synthetic ingredients.

It outlined new industry trends, including the use of advanced technologies like precision fermentation to produce next-generation sweeteners, and the development of functional sweeteners with added health benefits.

The core message was that the future of sweeteners will depend on a blend of biotechnology, AI-driven personalization, and sustainable production to create products that are healthier for both people and the planet.

After each presentation the Q& A session was done with all the speakers
A panel discussion, moderated by Dr. Shashank Bhalkar, Executive Director, PFNDAI, brought together eminent experts Mr Varinder Singh Jaswal, Senior Director – R&D India & SEA, Global Technical Center Lead, Mondelez International, Ms Nitika Vig, Sr. Specialist, Nutrition Strategy and Communication, Mondelez International, Dr. KSMS Raghavarao, Professor, IIT Tirupati.

The discussion began with the consumer perception of "healthy sweetness" in India, noting how younger generations are shifting toward natural alternatives such as stevia and monk fruit, while older generations remain cautious but curious about sugar substitutes. The panel emphasized that nutrition literacy in schools and colleges could play a transformative role in shaping mindful consumption habits.

Current research insights on the long-term impacts of high-intensity sweeteners were highlighted, with experts noting the need for continued investigation into their metabolic and gut health effects. In parallel, the panel acknowledged that balancing health and indulgence remains one of the most pressing R&D challenges for the food industry, especially under evolving regulatory frameworks.

The discussion also explored how marketing strategies can nudge consumers toward healthier choices and how collaborations between industry, researchers, policymakers, and consumers are vital for building a sustainable food system. On the question of whether sweetness should be reduced, replaced, or reimagined, the panel agreed that moderation and mindful consumption must guide future approaches.

From a technical perspective, the panel examined the functional roles of sweetness in food processing—including preservation, texture, and fermentation—and reviewed emerging innovations such as protein-based sweeteners and microbial fermentation-derived alternatives. They also identified critical research areas such as understanding the broader health impacts of sweetness and leveraging artificial intelligence and machine learning to optimize formulations and predict sensory outcomes.

In conclusion, the experts collectively emphasized that sweetness should not be eliminated but rather redefined in a balanced diet, allowing indulgence while promoting health-conscious choices. The way forward lies in scientific innovation, consumer education, and cross-sector collaboration.

Lastly, Ms Samreen Shaikh, Food Technologist at PFNDAI gave a vote of thanks to the webinar sponsor, speakers, and panellists along with her PFNDAI team members for making the webinar a success. She also thanked the attendees for patiently attending the webinar.

REGULATORY ROUND UP

AUTHOR
Dr Shashank Bhalkar,
Executive Director, PFNDAI
executivedirector@pfndai.org

Dear Readers,

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

Validity Order of FSSAI notified Food Testing laboratories as on 1st August 2025 : This order provides a list of FSSAI-approved laboratories with the validity of their accreditation as on 01.08.2025.

These can be used to carry out analysis of samples taken under the FSSA Act 2006 and regulations.

Food Safety and Standards (Labelling and Display) First Amendment Regulations, 2025, relating to standards of coffee chicory mixture : This final notification amends the declarations regarding Coffee – Chicory mixtures under FSS (Labelling and Display) Regulations 2020.The amendment is effective from 01 July 2026.

RESEARCH IN HEALTH & NUTRITION

Bioactive Nutrient Blend for Muscle Health

A science-backed blend of the vitamin B-related nutrients nicotinamide and pyridoxine is designed to support post-exercise recovery.

The new bioactive nutritional supplement targets accelerated muscle repair and stem cell activity. Exercise can strain skeletal muscle fibres, causing soreness and fatigue. Negative impacts on training and performance can happen if the body does not properly repair and rebuild its muscles after exercising, making muscle recovery an essential part of any type of fitness routine.

Bioactive blend of nicotinamide and pyridoxine—both vitamin B-related nutrients—targets skeletal muscle regeneration by activating local stem cells, a mechanism that's increasingly recognized as central to muscle repair following exercise-induced microtrauma.

The research, published in the Journal of Clinical Investigation and conducted in collaboration with the Institute NeuroMyo Gène and the University of Copenhagen, reflects a rigorous screening of over 50,000 natural molecules. The identification of nicotinamide and pyridoxine as synergistic activators of muscle stem cells is especially compelling, given their established roles in cellular metabolism and neurotransmitter synthesis. Clinical validation of this blend in human participants adds translational weight to the findings, positioning it as more than just a functional supplement—it's a targeted intervention grounded in regenerative biology.

https://www.nutritioninsight.com/news/nestl-muscle-repair-vitamin-b-sports-nurtition.html

Gut Bacteria May Induce Fat Loss and Regulate Blood Sugar

Scientists have discovered a protein-producing bacterial strain, Ruminococcus torques, that could play a role in fat metabolism with the potential to open a new class of biological drugs known as pharmabiotics. They say the two proteins resemble the hormone irisin, released by muscles during exercise, which breaks down fat.

This discovery of Ruminococcus torques and its Rordep1 and Rordep2 proteins, published in Nature Microbiology, could mark a paradigm shift in how we approach metabolic health—from reactive treatment to proactive microbial modulation. The fact that these proteins mimic irisin, a myokine released during exercise, and stimulate endogenous GLP-1 and PYY while suppressing GIP, positions them as potent regulators of fat metabolism, glycemic control, and even bone density.

GLP-1 agonists like semaglutide have already revolutionized obesity and diabetes management, but they come with cost, accessibility, and adherence challenges. If gut bacteria can be harnessed to naturally stimulate GLP-1 production, we may be looking at a new generation of pharmabiotics—biological therapeutics derived from or delivered via the microbiome. This aligns with the growing interest in second-generation probiotics that go beyond gut health to influence systemic physiology.

https://www.nutritioninsight.com/news/gut-bacteria-glp-1-fat-loss-blood-sugar.html

Beetroot May Lower Blood Pressure by Reducing "Bad" Oral Bacteria

Older people who experience the blood pressure-lowering effect of nitrate-rich beetroot juice may be benefiting from changes in their oral microbiome, suggests the recently published and largest study on the subject.

Scientists at the University of Exeter, UK, compared responses between a group of older adults to that of younger adults. When they drank a concentrated beetroot juice shot twice a day for two weeks, their blood pressure decreased —

an effect not observed among the younger participants.

Nitrate is crucial to the body and is commonly found in certain vegetables, which are converted into nitric oxide. Nitric oxide is key to the healthy functioning of the blood vessels by helping regulate blood pressure. The randomized, placebo-controlled trial involved 75 participants divided into younger (under 30) and older (60s–70s) cohorts. Each group consumed concentrated beetroot juice twice daily for two weeks, followed by a two-week washout and a placebo phase. Notably, only the older adults experienced a significant reduction in blood pressure, correlating with distinct microbial changes in the mouth.

Gene sequencing revealed a decrease in Prevotella, a genus associated with inflammation and poor cardiovascular outcomes, and an increase in Neisseria, which is known to facilitate nitrate-to-nitrite conversion—a critical step in nitric oxide synthesis. These microbial shifts suggest that age-related differences in oral microbiota may influence the bioavailability of nitric oxide and the efficacy of dietary nitrate interventions.

In parallel, a related study on postmenopausal women found that 12 weeks of beetroot extract supplementation improved carotid artery stiffness, reinforcing its potential role in cardiovascular support for high-risk groups.

This research opens avenues for functional food innovation, especially in the context of aging and microbiome modulation. It invites exploration of synergistic formulations—perhaps combining nitrate-rich botanicals with prebiotics or probiotics that support beneficial oral bacteria.

https://www.nutritioninsight.com/news/beetroot-blood-pressure-cardiovascular-heart-oral-bacteria.html

Pregnancy Snacks, Trending Formats and New Ingredients

Transformations in prenatal nutrition are being driven by advancements in ingredient technology, innovative product formats, and a growing understanding of the nuanced needs of expecting parents.

From formulation advances around essential vitamins to specialized ingredients addressing male fertility and the demands of later-life pregnancies, the industry is recalibrating to offer more targeted and personalized support.

Traditional capsules are giving way to more palatable and sensory-friendly options such as gummies, nutrient-enriched snacks, and drink mixes. These formats are particularly suited to pregnant women experiencing heightened taste and smell sensitivities. Companies are responding with sachets and vegan-friendly drink blends that align with clean label and personalization trends. Ingredient design now prioritizes solubility, mouthfeel, and flavour masking to avoid metallic or unpleasant sensory profiles.

Folate innovation is central to this shift. Conventional folic acid is being replaced by bioactive forms like 5-MTHF, which offer superior methylation support—a process essential for DNA synthesis and fetal development. Clinical evidence showing improved blood folate levels and reduced risks of neural tube defects and pregnancy complications. These advanced folate forms also enhance homocysteine metabolism, especially when paired with vitamins B6 and B12.

Iron supplementation is another focal point, given its role in oxygen transport and fetal cognitive development. Yet common forms like ferrous fumarate often cause gastrointestinal distress and fail to correct deficiencies. Ferrous bisglycinate, demonstrates higher bioavailability and a 64% reduction in digestive side effects, marking a significant improvement in tolerability and efficacy.

As childbearing is increasingly delayed, formulations are being tailored to support egg quality, mitochondrial function, and oxidative stress. Ubiquinol, the active form of CoQ10, is spotlighted for its role in cellular energy and antioxidant defence—particularly relevant for IVF and conditions like endometriosis.

AI-powered platforms are emerging to dynamically adjust nutrition plans based on real-time inputs from wearables and

predictive analytics. This anticipatory model allows for early detection of deficiencies and risks, enabling proactive intervention.

Meanwhile, the maternal gut microbiome is being recognized as a foundational pillar of prenatal health, with targeted probiotic and prebiotic formulations gaining traction.

https://www.nutritioninsight.com/news/prenatal-supplements-pregnancy-fertility-folate-iron-vitamins.html

Fermented Stevia Leaf Extract Useful in Pancreatic Cancer Treatment

Stevia leaf extract fermented with bacteria isolated from banana leaves may kill off pancreatic cancer cells without harming healthy kidney cells, according to scientists at Hiroshima University, Japan.

The researchers note that the fermented stevia leaf extract showed "significantly enhanced" antioxidant activities and cytotoxicity — the ability to damage or kill cells — against pancreatic cancer cells in the lab. Additional testing demonstrated that the extract effectively inhibited the proliferation and migration of these cancer cells.

The study centres on stevia leaf extract fermented with Lactobacillus plantarum SN13T, a strain isolated from banana leaves. Researchers found that fermentation significantly enhanced the extract's antioxidant and cytotoxic properties against pancreatic cancer cells, while sparing healthy kidney cells (HEK-293). This selective cytotoxicity is crucial for therapeutic viability.

Further analysis identified chlorogenic acid methyl ester (CAME) as the key anticancer compound in the fermented extract. CAME was shown to inhibit cancer cell proliferation and migration, arrest the cell cycle, and regulate apoptosis-related gene expression.

Interestingly, fermentation reduced chlorogenic acid levels sixfold, suggesting enzymatic transformation by the bacteria. CAME exhibited stronger pro-apoptotic effects than chlorogenic acid alone, reinforcing the therapeutic relevance of microbial processing.

https://www.nutritioninsight.com/news/fermented-stevia-extract-pancreatic-cancer-cells.html

Gut Microbes Tell Brain to Stop Eating

Researchers have discovered a pathway between the gut microbes and the brain that can suppress appetite and, thereby, directly influence our behaviours.

When cells in this pathway miss key receptors or if the pathway is disrupted in other aspects, microbes may not help signal the brain to stop eating, leading to a greater risk of chronic diseases like obesity.

Published in Nature, the study focuses on tiny sensor cells called neuropods that line the colon. These cells detect a common microbial protein and send messages to the brain to help curb appetite.

The study introduces the concept of a "neurobiotic sense"—a real-time neural response to microbial signals in the gut that can suppress eating behaviour. At the heart of the research are specialized sensor cells called neuropods, located in the colon.

These cells detect microbial proteins—specifically flagellin, a structural component of bacterial flagella—and transmit signals to the brain via the vagus nerve.

This interaction hinges on the presence of the TLR5 receptor, which enables neuropods to recognize flagellin and initiate appetite-suppressing signals.

Experimental data from mice demonstrated that administering flagellin directly into the colon reduced food intake. However, mice lacking the TLR5 receptor did not respond to flagellin and continued eating, leading to weight gain.

This confirms that the flagellin–TLR5–neuropod axis plays a critical role in signalling satiety to the brain.

https://www.nutritioninsight.com/news/gut-brain-axis-microbes-appetite.html

Gluten or Wheat Allergies Psychological and Linked to IBS

New research has uncovered that many people with irritable bowel syndrome (IBS) who believe they are sensitive to gluten or wheat may not actually have allergies to these ingredients.

Affecting an estimated 10% of Canadians, IBS is an intestinal disorder with one of the highest prevalence rates globally, according to the Canadian Digestive Health Foundation. Its underlying cause is unclear, and it can be disruptive and debilitating.The McMaster University, US, study investigated participants with clinically diagnosed IBS who reportedly felt better eating gluten-free. They were fed cereal bars containing either gluten, whole wheat, or neither in a random order.

Participants with clinically diagnosed IBS were given cereal bars containing gluten, whole wheat, or neither, in random order. Surprisingly, symptom severity was similar across all groups—including the gluten-free placebo—suggesting that perceived symptoms may be driven more by psychological expectations than by actual food components. This aligns with the "nocebo effect," where negative beliefs alone can trigger real physical symptoms.

Senior author Dr. Premysl Bercik emphasizes that while some individuals do have genuine gluten sensitivity, many others may be reacting to the idea of gluten rather than the substance itself. When participants were informed which bars caused symptoms, most did not revise their beliefs or dietary habits, underscoring the psychological dimension of food intolerance.

Bercik advocates for a more holistic approach to IBS management, integrating psychological care alongside dietary guidance. He cites the Cara Care app—recently acquired by Bayer—as a model for combining cognitive behavioural therapy, hypnosis, and personalized diet plans (e.g., low-FODMAP) to help patients manage symptoms and address underlying anxiety and depression.

https://www.nutritioninsight.com/news/irritable-bowel-syndrome-ibs-gluten-wheat-allergy.html

Carotenoid Extract Targets Glaucoma and Dry Eye

A capsanthin-rich carotenoid extract supports eye health. Its use reduces intraocular pressure associated with multiple types of glaucoma, including normal tension and primary open-angle glaucoma.

Capsanthin-rich extract derived from Capsicum annuum and standardized to 50% capsanthin, has demonstrated efficacy in reducing intraocular pressure associated with normal tension and primary open-angle glaucoma—two of the most prevalent forms of the condition. This positions the ingredient as a promising non-pharmaceutical intervention in ocular health.

Its dual functionality—supporting both intraocular pressure regulation and tear film stability—addresses two distinct but increasingly common conditions. Dry eye, now affecting up to 30% of European adults, is exacerbated by screen exposure, aging, and environmental stressors.

The ingredient's potential to enhance tear production and hydration makes it particularly relevant for lifestyle-driven eye discomfort. Its inclusion in dietary supplements could fill a notable gap in the eye health category, where options for non-pharmaceutical support remain limited despite rising consumer awareness.

https://www.nutritioninsight.com/news/unibar-eu-patent-capsiclear-eye-health.html

Gut-Brain Axis: Prebiotic Diet Boosts GABA Levels

New research sheds light on the intricate connection between the gut microbiome and the brain, suggesting that a prebiotic diet might boost brain GABA (gamma-aminobutyric acid) levels, a key neurotransmitter associated with calming effects and neurological health.

GABA is an amino acid functioning as the principal inhibitory neurotransmitter that can act on the brain to slow or stop the reception of certain signals to the brain, leading to a calmer and more relaxed state.

Low GABA levels in the brain have been associated with neurological disorders and diseases like depression, Alzheimer's, or epilepsy.

This study from Hiroshima University adds compelling depth to the evolving narrative around the gut–brain axis, particularly the role of prebiotics in modulating neurological health via microbial pathways. The research demonstrates that dietary supplementation with fructo-oligosaccharides (FOS) and Aspergillus-derived enzymes (lipase and protease) significantly elevated brain GABA levels in mice—especially in the cortex and hippocampus, regions critical for emotional regulation and excitability control.

While the blood–brain barrier remains a physiological hurdle for direct GABA transfer, the study suggests alternative mechanisms—such as vagus nerve stimulation or hormonal signalling—may mediate the observed increase in brain GABA. This aligns with emerging models of gut–brain communication that emphasize bidirectional signalling beyond mere metabolite transport.

The elevation of homocarnosine, a GABA-containing peptide with neuroprotective properties, further supports the hypothesis that gut microbiota modulation can influence central nervous system biochemistry. Kumrungsee's earlier work linking homocarnosine deficiency to depression-like behaviours adds weight to the therapeutic potential of these findings.

https://www.nutritioninsight.com/news/gaba-gut-brain-microbiome-probiotics-prebiotics.html

India's Protein Consumption Increases but Rural Calorie Levels Fall Short

The average calorie intake in India remains below recommended levels in rural areas, a new government report shows. However, protein consumption in these communities appears adequate in rural and urban areas.

The report, "Nutritional Intake in India," calculates daily calorie, protein, and fat intake based on food consumption data across various socio-economic classes for the periods August 2022 to July 2023 and August 2023 to July 2024.

The report offers a nuanced snapshot of evolving dietary patterns across rural and urban populations. While protein intake now meets or exceeds ICMR recommendations for sedentary adults—averaging 61.8 g/day in rural areas and 63.4 g/day in urban zones—the persistent shortfall in rural calorie intake remains a concern. At 2,212 kcal/day, rural averages fall below the 2,400 kcal/day benchmark, suggesting that energy sufficiency is still elusive for many, despite modest gains among lower-income groups.

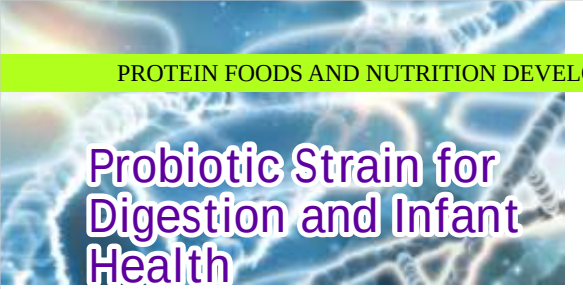
The shift away from cereal-dominant protein sources is particularly noteworthy. Cereals still contribute nearly half of rural protein intake, but their share has declined significantly since 2009–10, replaced by incremental rises in eggs, fish, meat, and dairy.

This transition reflects both changing consumption patterns and the gradual penetration of more diverse protein sources, even within predominantly vegetarian populations. Yet, access to affordable dairy remains uneven, despite India's status as the world's largest milk producer—a paradox that underscores systemic distribution and affordability challenges.

The report also flags rising fat intake—60.4 g/day in rural areas and 69.8 g/day in urban settings—likely driven by increased consumption of processed foods and edible oils. This trend, while within ICMR guidelines, may signal a shift toward energy-dense but nutrient-poor diets, especially in urban contexts.

Government initiatives like Poshan 2.0 and Saksham Anganwadi aim to address these gaps, with a focus on maternal and child nutrition, digital health monitoring, and curbing ultra-processed food consumption. The Public Distribution System continues to play a transformative role, not only in food access but also in mitigating climate shocks and improving child health outcomes.

https://www.nutritioninsight.com/news/indias-protein-consumption-increases-but-calorie-levels-fall-short-in-rural-areas.html



Probiotic Strain for Digestion and Infant Health

An extensive peer-reviewed review gathers decades of research into Novonesis' BB-12 (Bifidobacterium animalis subsp. lactis), one of the most thoroughly researched probiotic strains. It offers a singular, accessible resource encompassing the strain's mechanisms of action, clinical efficacy, and its relevance across all stages of life.

The review details the BB-12 strain's various attributes, including its survival in the gastrointestinal tract, bile salt tolerance and metabolic activity, adherence to intestinal epithelial cells, immune modulation, and its impact on gut microbiota and short-chain fatty acid production. It also covers its clinical efficacy in constipation and infant colic.

This review on consolidates over three decades of research into one comprehensive scientific resource, positioning the strain as a benchmark in probiotic science. Featured in Frontiers in Microbiology, the manuscript synthesizes findings from more than 400 publications and 200 clinical studies, offering a detailed account of BB-12's mechanisms of action, clinical efficacy, and relevance across life stages—from infancy to adulthood.

Key highlights include BB-12's resilience in the gastrointestinal tract, with proven survival through acidic pH and bile salt exposure. Though its colonization is transient, the strain demonstrates meaningful interaction with host epithelial and immune cells, enhancing mucosal barrier integrity, modulating immune responses, and stimulating IgA secretion. It also promotes beneficial shifts in gut microbiota composition and short-chain fatty acid production—both critical for digestive and systemic health.

Clinically, BB-12 has shown efficacy in managing constipation and infant colic, reinforcing its utility in both pediatric and adult populations. The review underscores its role in reducing inflammation and supporting immune regulation, making it a versatile candidate for formulations targeting gut–immune axis modulation.

https://www.nutritioninsight.com/news/probiotics-digestion-infant-health-gut-novonesis-bb12.html

Mother's Inflammatory Diet & Child Developing Diabetes

A new observational study of 67,701 mother-child pairs has found that diets high in foods promoting low-grade inflammation during pregnancy may raise the risk of the child developing type 1 diabetes.

Also, a 10 g increase in a mother's gluten intake during pregnancy was associated with a 36% increase in risk.

The study, published in the Journal of Epidemiology & Community Health, found that for every unit increase in dietary measure of inflammatory food intake, there is a 16% increase in risk. Over an average of 17 years of tracking, 281 people (nearly 0.5%) developed the condition. At diagnosis, their average age was ten.

A pro-inflammatory dietary pattern—quantified using the Empirical Dietary Inflammatory Index (EDII)—was independently associated with increased diabetes risk in offspring.

Each unit increase in the EDII score correlated with a 16% rise in the child's risk of developing type 1 diabetes, while a 10 g increase in maternal gluten intake was linked to a 36% higher risk.

These associations were independent of total energy intake, birth weight, or child's sex, but were compounded by maternal smoking and higher BMI during early pregnancy.

The study identifies mid-pregnancy as a potentially critical window during which fetal immune programming may be influenced by maternal lifestyle factors.

Foods contributing to higher EDII scores included red and processed meats, sugar-sweetened beverages, refined grains, deep-fried items, and trans fats—while anti-inflammatory diets were rich in alliums, whole grains, leafy greens, fruits, dark meat fish, and tea.

https://www.nutritioninsight.com/news/mother-child-diet-diabetes-risk.html

Vitamin K2 For Bone Health and Mobility Support

As aging populations grow and active lifestyles become more common across all age groups, the demand for effective, science-backed solutions to support bone strength is rising.

While calcium and vitamin D have long been the cornerstones of bone health, vitamin K2 is moving to the forefront of the nutraceutical space and is bringing forward a new generation of innovations, ranging from plant-based and precision fermented ingredients to cutting-edge paired formulations.These ingredients and compound formulations not only aim to enhance bone mineral density but also address inflammation, collagen synthesis, and tissue repair.

Vitamin K2—particularly in its MK-7 form—is emerging as a central player alongside calcium and vitamin D3. As aging populations and active lifestyles converge, the demand for multifunctional, science-backed ingredients is accelerating innovation across the nutraceutical sector.

Vitamin K2 MK-7, designed to activate osteocalcin and Matrix Gla Protein (MGP). These proteins respectively direct calcium to bones and prevent its deposition in arteries, addressing calcium's dual role as both essential and potentially harmful. This dual-action mechanism positions K2 as a "bone health with a bonus" solution, with implications for cardiovascular safety.

Clinical validation is robust: MenaQ7 has been featured in 22 human trials, and meta-analyses involving over 12,000 participants show improvements in lumbar spine bone mineral density (BMD), reduced fracture risk, and enhanced extrahepatic vitamin K status. Notably, K2 supplementation may also mitigate risks associated with bisphosphonate therapy, such as osteonecrosis of the jaw.

For formulators and health professionals, this signals a new era of bone health strategy—one that integrates precision fermentation, bioavailability optimization, and synergistic nutrient pairing.

https://www.nutritioninsight.com/news/balchem-gnosis-by-lesaffre-vitamin-k2-bone-health-innovation-special-report.html

Performance Proteins for an Active Lifestyle

Industry experts emphasize that performance proteins are no longer confined to athletes.

They say protein-rich products are shifting from specialized sports nutrition to “everyday nutrition essentials” to help people maintain an active lifestyle. While consumers demand taste, texture, and nutritional value, nutrition companies are also innovating with new formats and expanding protein science. The performance proteinsonce the domain of elite athletes, are now central to mainstream nutrition strategies for people of all ages and activity levels. This reflects broader consumer interest in muscle health, metabolic support, and healthy aging, with innovations spanning ingredient science, delivery formats, and sensory experience.

Protein-rich products are now consumed by older adults, busy professionals, and moderately active individuals seeking convenient, functional nutrition. Protein is recognized not just for muscle repair but also for satiety, metabolic health, and cognitive support. The market is seeing a rise in hybrid protein products that combine plant and animal sources to balance sustainability with nutritional completeness. While plant-based proteins are in demand, taste and texture remain barriers. Fava bean isolate is highlighted for its neutral flavour and functional benefits like solubility and emulsification, making it suitable for ready-to-drink and UHT applications.

Research underscores the value of casein protein for overnight muscle recovery. Unlike fast-digesting whey, casein provides a sustained amino acid release, promoting prolonged muscle protein synthesis. Clinical trials show that pre-sleep ingestion of casein enhances both myofibrillar and mitochondrial protein synthesis, especially after evening exercise.

Partially hydrolysed protein and milk fat globule membrane (MFGM) improve balance and physical performance in elderly women—even without added exercise. Nutri F+ formulation, high in protein and phospholipids, is designed to support brain health and cognitive function, reflecting a broader definition of “performance” that includes mental resilience.

Taste and mouthfeel are now critical differentiators. A lactose-free milk protein concentrate, delivers natural flavour without masking agents, supporting clean-label trends and digestive comfort. Their patented filtration method enables products with as little as 0.01% lactose, addressing gastrointestinal sensitivity.

There is a surge in product launches featuring whey isolates, protein coffees, high-protein cereals, and protein-infused waters. These formats reflect the “round-the-clock protein” trend, where consumers seek functional nutrition throughout the day. The convergence of taste, science, and convenience is driving innovation across demographics.In essence, performance proteins are evolving into foundational components of everyday nutrition, with applications that span physical recovery, cognitive support, and aging wellness.

https://www.nutritioninsight.com/news/performance-proteins-healthy-aging-active-lifestyle.html

Omega-3 Advances Break Down Sensory Barriers for Enjoyable Formats

As consumers seek omega-3 supplements that combine efficacy with an enjoyable experience, they are demanding products with sensory appeal, clean label ingredients, and a convenient format.

New delivery technologies and consumer expectations are reshaping the omega-3 market, urging brands to go beyond “science-backed” claims to meet demand for enjoyable solutions.

As the market matures and consumer expectations rise, the focus is shifting from mere efficacy to a holistic consumption experience—encompassing taste, texture, convenience, and clean-label appeal. To remain competitive, brands must deliver supplements that integrate seamlessly into daily life and offer a pleasant sensory experience. This is particularly relevant for omega-3s, which are often associated with fishy aftertaste, reflux, and confusion around source types (EPA, DHA, ALA) and sustainability concerns.

Advanced delivery formats such as deodorized oils, enteric coatings, and encapsulation technologies eliminate unpleasant aftertastes and improve bioavailability. Experience-enhancing formats like gummies, soft chews, and emulsions are favoured for their taste and ease of use. A patented plant-based enteric softgel using gellan gum, offers acid resistance and targeted intestinal release without carrageenan. This format supports clean-label positioning and minimizes gastric irritation, heartburn, and sensory discomfort.

Rigorous sensory validation, with R&D and sourcing teams ensures high-quality raw materials and long-term stability across formats. The EU's Packaging and Packaging Waste Regulation mandates recyclable packaging by 2030, challenging brands to balance oxidative stability with sustainability— especially for sensitive fish oils. EFSA is set to reassess the safe intake level of DHA by mid-2026, following data suggesting that consumers may be exceeding the current 1 g/day threshold due to its inclusion in novel food sources.

https://www.nutritioninsight.com/news/sirio-pharma-omega-3-benefits-taste-supplements.html

Nutritious Plant-Forward Trend for Adventurous Innovation

As plant-based meat loses its shine for some consumers, research reveals rising demand for authenticity, bold and adventurous flavours, and options for products in this category that offer excitement, nutrition, and sustainability without necessarily trying to imitate meat.

Givaudan conducted a proprietary market and consumer research study with over 3,000 European consumers and 250 industry experts. While the plant-based meat category initially grew due to consumers' desire to reduce their meat intake, many now feel that the current offer is underperforming.

Consumers are now demanding more than mimicry—they want authenticity, nutrition, and sensory excitement. Givaudan's concept captures this evolution: a move toward plant-forward products that celebrate their botanical origins rather than imitate animal proteins.

While early adopters were drawn by ethical and health motivations, many are now disillusioned by ultra-processing, lacklustre taste, and unmet expectations. The cited statistics—12% of consumers abandoning plant-based meat and 17% reducing consumption—underscore the urgency for innovation. Givaudan's response is multifaceted: flavour technologies aim to elevate sensory profiles, while ingredient strategies involving mycoproteins, algae, and microbial fermentation signal a pivot toward cleaner, more functional formulations.

A berry-based protein that doubles as a sugar substitute, developed via microbial fermentation, it exemplifies the kind of hybrid innovation that aligns with both health and sustainability goals. This approach resonates with flexitarian consumers who seek indulgence without compromise.

Plant-based BBQ space as ripe for disruption. Current offerings lack variety and sensory impact, but expertise to recreate the multisensory cues of traditional BBQ—smoky aroma, juicy texture, and rich taste—without relying on meat analogues. This aligns with broader consumer desires for excitement and novelty, which are often overlooked in the category.

In sum, the next wave of plant-based innovation will likely be defined not by imitation, but by bold, nutrient-dense, culturally resonant products that embrace their plant-forward identity.

https://www.nutritioninsight.com/news/givaudan-plant-based-meat-nutrition-innovation.html

Biotech & Enzyme Breakthroughs Transforming Food, Health and Sustainability

With the food industry facing pressure from consumers and regulations to opt for more sustainable business production and manufacturing, experts unveil how biotechnology is stepping into the spotlight.

The nutrition ingredients and science provider says the climate crisis and the need for cleaner production have enabled smarter solutions to proliferate.

Webinars on biotechnology and enzyme innovation, spotlighting how molecular biology and AI-driven tools are reshaping food production, health, and sustainability. With mounting pressure from consumers and regulators to adopt cleaner manufacturing practices, biotech as a key enabler of next-generation solutions.

Two major shifts are driving the surge in enzyme interest. First, molecular biology has matured to the point where modifying enzymes and microbial strains is no longer a technical bottleneck. Second, industry acceptance of engineered enzymes and microbial production hosts has grown, due to successful examples of optimized processes with these tools.

Nature doesn't always offer enzymes suited for industrial needs, but modern techniques now allow scientists to tailor enzyme properties—enhancing stability, specificity, or activity for targeted applications. This opens the door to more sustainable and efficient food processing systems.

AI-based annotation tools now make it possible to sift through vast enzyme libraries to identify candidates with specific traits or functions.The advances are supported by affordable DNA synthesis and high-throughput screening technologies, which accelerate the pace of discovery and commercialization. The result is a more agile and responsive innovation pipeline for food and nutrition companies.

The biotech breakthroughs aren't just scientific; they're commercially viable and environmentally impactful. By customizing enzymes and scaling microbial fermentation, companies can reduce resource use, improve product quality, and meet sustainability targets.

https://www.nutritioninsight.com/news/webinar-preview-kerry-talks-biotech-and-enzyme-breakthroughs-transforming-food-health-and-sustainability.html

New scientific review calls for plant-based milk fortification

Despite growing consumer interest in plant-based alternatives, the UK's Scientific Advisory Committee on Nutrition (SACN) and the Committee on Toxicity of Chemicals in Food, Consumer Products and the Environment (COT) concluded that, as of early 2022, no almond, oat, or soy drink available in the UK was nutritionally equivalent to cow milk.

This SACN–COT joint review not only validates the role of fortified plant-based drinks in public health nutrition but also exposes critical gaps that must be addressed to ensure their safe and effective use—especially among vulnerable populations like young children and vegans.

The committees' benefit-risk assessment underscores that while fortified almond, oat, and soy drinks offer advantages such as lower saturated fat, higher fibre, and improved vitamin D levels compared to cow milk, they fall short in key nutrients like vitamin A, iodine, and protein—particularly in unfortified or sweetened versions. Soy drinks emerge as the most nutritionally comparable to cow milk, especially in terms of protein quality, but concerns around isoflavone exposure in young children highlight the need for dietary diversification.

From a regulatory standpoint, the call to standardize fortification—specifically with vitamin A, riboflavin, B12, calcium, iodine, and vitamin D—signals a shift toward harmonizing plant-based milk

with traditional dairy in terms of nutritional adequacy. The exclusion of organic products from fortification due to current UK regulations introduces a layer of complexity, potentially limiting access to nutritionally complete options for consumers who prioritize organic labelling.

For industry stakeholders, this presents both a challenge and an opportunity. Reformulating products to meet these enhanced nutritional profiles could unlock access to government programs, while also aligning with consumer demand for clean-label, unsweetened, and functional beverages. The report's emphasis on transparency and evidence-based formulation may catalyse innovation in protein sources, micronutrient delivery systems, and organoleptic improvements—especially as technologies evolve to address taste and texture barriers in ingredients like algae-based proteins.
https://www.nutritioninsight.com/news/sacn-cot-plant-based-milk-nutritional-gaps-childrens-health.html

Study Confirms Safety and Nutrition of Cultivated Protein for Dogs

New peer-reviewed research confirms FeedKind Pet cultured protein is a "safe, highly digestible" ingredient for adult dogs that shows promising early signs of supporting canine gut health.

Product is a stable and scalable supply of protein that does not compete with human food resources. The protein is made using little water and no agricultural land by naturally fermenting carbon to create a "safe, nutritious, and traceable protein."

This study on pet protein represents a significant milestone in the evolution of alternative proteins for companion animals. The eight-month trial, conducted under FDA Center for Veterinary Medicine guidelines and published in Animals, confirms that it is not only safe and well-tolerated by adult dogs but also offers high digestibility and potential gut health benefits—particularly through increased alpha diversity in the fecal microbiome.

Production method—fermenting carbon without using agricultural land or significant water—positions it as a sustainable, non-GMO protein source that doesn't compete with human food systems. Its complete amino acid profile and digestibility metrics (over 80% for protein and energy, over 90% for fat) make it a compelling option for pet food formulators seeking both nutritional performance and environmental responsibility.

The study's findings are especially relevant in light of broader pet nutrition trends. ADM's research highlights the convergence of human and pet food preferences, with rising demand for functional ingredients, clean label formulations, and alternative proteins. Meanwhile, other innovations—like IFF's enzyme-driven palatability enhancers, Beneo's low-glycemic beet-derived syrup, and ProtaSTAR's premium potato protein—underscore the sector's rapid diversification. These developments reflect a growing emphasis on digestibility, metabolic health, and ingredient transparency, particularly for vegan, grain-free, and semi-moist pet food formats.

https://www.nutritioninsight.com/news/fermentation-protein-pet-food-dogs-feedkind-calysta.html

FlavourMaskers to Elevate Plant-Based Protein Taste

dsm-firmenich has launched its range of ModulaSense maskers to enhance the flavour of its sustainable rapeseed protein isolate, Vertis CanolaPro.

The flavour maskers target and neutralize bitterness, astringency, and liquorice-like notes at a "molecular level" to enhance the taste of ready-to-mix (RTM) drinks and protein bars.The maskers use receptor-based technology to specifically block or mask specific taste components that can negatively affect the sensory experience of food products. This allows manufacturers to incorporate higher levels of plant proteins into these products without compromising taste.

Flavour maskers represent a sophisticated leap in addressing one of the most persistent challenges in plant-based protein formulation: off-notes that compromise consumer acceptance. By targeting bitterness, astringency, and liquorice-like flavours at the molecular level using receptor-based technology, enables higher inclusion levels without sacrificing taste.

CanolaPro itself is a notable innovation—a rapeseed protein isolate with a PDCAAS of 1, free from major allergens, and derived from a valorised canola oil side stream.

Its functional properties (solubility, emulsification, foaming, gelation) make it versatile across formats, but its sensory drawbacks have historically limited its use. ModulaSense directly addresses this barrier, unlocking new formulation potential in RTM drinks and protein bars, with future applications likely to follow.

This approach aligns with broader market dynamics where demand for high-protein, plant-based products is surging, but taste remains a key bottleneck. The molecular understanding of protein–receptor interactions and validated via sensory panels—offers a scalable solution for manufacturers seeking to balance nutrition, sustainability, and palatability.

https://www.nutritioninsight.com/news/dsm-firmenich-flavor-maskers-plant-proteins.html

Rise of sugar reduction and industry response

Growing concerns and research around sugary foods' adverse health effects are driving the nutrition industry to innovate, reformulate, and meet consumer expectations for taste and health benefits.

Ingredion observes a rising global demand for reduced- or sugar-free products as consumers actively seek healthier products that fit a balanced diet.

Latest insights into sugar reduction reflect a convergence of consumer demand, scientific evidence, and formulation innovation that's reshaping the global food and beverage landscape. Approximately 70% of global consumers now actively seek reduced-sugar products, with many willing to pay a premium for added functional health benefits. Yet, taste remains non-negotiable—consumers expect the same sensory experience they associate with full-sugar products.

The company's approach centres on clean label solutions, particularly stevia-based sweeteners, which resonate with consumers due to their natural origin and simplicity. Ingredion's proprietary Atlas study confirms that North American consumers, in particular, perceive stevia more favourably than artificial alternatives. However, the line between natural and artificial sweeteners is increasingly blurred, driven by cost-performance dynamics and the superior taste outcomes of blended sweetener systems.

Blind taste tests conducted across multiple regions—including India, Europe, and the Americas—revealed that consumers often preferred beverages sweetened with multi-sweetener blends over single-sweetener or full-sugar versions. This growing acceptance of reduced-sugar formulations reinforces the global momentum toward reformulation.

To support manufacturers, Ingredion has developed clean taste solutions optimized for specific applications. These leverage genomic mapping of stevia to fine-tune molecular contributions to taste, and also address texture challenges that arise when sugar is removed. Their ready-to-use models allow for rapid iteration based on brand-specific feedback, balancing nutrition, taste, texture, and labelling claims.

https://www.nutritioninsight.com/news/ingredion-sugar-reduction-weight-management.html

Overcoming Taste and Texture Barriers in Plant-Based

As demand for plant-based options grows, food tech innovators face mounting pressure to deliver products that meet ethical, health, and taste goals.

Nutrition Insight continues its conversation with experts from ADM, ACI Group, Ingood by Olga, and Roquette, who share how they overcome sensory, nutritional, and clean label hurdles. The specialists examined how trends like flexitarian diets, clean labels, hybrid innovations, anti-obesity medications (AOMs), and postbiotics are influencing the plant-based space.

This expert roundtable from Nutrition Insight offers a

comprehensive look at how leading ingredient developers are tackling the persistent sensory and nutritional challenges in plant-based product formulation. As consumer expectations rise—especially among flexitarians and health-conscious buyers—taste, texture, and clean-label integrity have become non-negotiable.

While demand for plant-based products is booming, the sensory experience must match traditional counterparts. Taste modulation technologies are increasingly used to mask off-notes like bitterness or mealy mouthfeel, enabling shorter ingredient lists without compromising flavour or nutrition. These technologies are especially critical as brands move away from sugar, salt, and artificial additives.

Systems and flavour modulation platform address these issues by combining clean-tasting soy, pea, and bean proteins with functional attributes like emulsification and water-binding. The AccelFlex pea protein, for instance, offers reduced sodium and allergen-free labelling, while maintaining structural integrity and sensory appeal.

Consumers benchmark plant-based alternatives against meat, making succulence and chew essential. Nutralys T Pea protein isolates are engineered to deliver firmness, digestibility, and creamy mouthfeel—especially in sports nutrition formats where texture complaints are common. These proteins also support low-sodium, high-protein formulations with clean labels.

With focus on Nutri-Score optimization, amino acid profiles, and bioavailability one team uses fermentation to reduce anti-nutritional factors and improve protein quality, while also enhancing fibre and omega-3/omega-6 balance.

Their approach supports low-sugar, low-saturated fat formulations that meet both health and sensory expectations.

https://www.nutritioninsight.com/news/plant-based-nutrition-taste-texture.html

Salt Reduction Technologies: Yeast Extracts to Limit Sodium

As regulatory pressure to reduce sodium intensifies, food manufacturers face the challenge of reformulating popular products without losing flavour appeal.

Summer is a critical period for savoury foods like barbecue meats, dips, and salty snacks, making salt reduction strategies especially important for brands seeking to meet health guidelines while satisfying consumer expectations.

To explore practical solutions, Food Ingredients First speaks with Daria Pashkova, product and marketing manager at Ohly.

The company develops yeast-based ingredients designed to support sodium reduction by preserving savoury flavour profiles in demanding applications such as snacks and marinades.

Ohly's approach centres on yeast extracts, which are fermentation-derived ingredients rich in glutamic acid, nucleotides, and peptides.

These compounds interact with umami receptors to amplify savoury perception and perceived salinity, allowing for meaningful sodium reduction without compromising flavour.

Unlike potassium chloride, which can introduce metallic or bitter off-notes, yeast extracts can be tailored to mask such undesirable flavours through strain selection and compositional adjustments.

The versatility of yeast extracts extends across applications—from snacks and marinades to creamy dips and soups—where they also contribute to kokumi and mouthfeel, particularly in low-fat or plant-based formulations.

Ohly's Provesta 512, for instance, is designed to enhance the flavour profile of other ingredients and has achieved consumer liking scores that exceed those of full-sodium counterparts.

The broader market context is shifting toward clean-label, low-sodium products, driven by new front-of-pack labelling regulations and rising health awareness in regions like Asia Pacific and the Americas.

Pashkova emphasizes that successful reformulation requires more than salt substitution; it demands a holistic flavour strategy that may involve rebalancing other ingredients to maintain sensory harmony.

https://www.foodingredientsfirst.com/news/salt-reduction-yeast-extracts-umami.html

Healthy Snacking: To Meet Wellness Demands

Healthy snacking is fundamentally transforming, driven by consumers seeking more than just low-calorie or fat-free options.

They now expect snacks to deliver functional benefits such as digestive support and emotional well-being, without compromising on taste or texture. This is fuelling a wave of innovation focused on purposeful and better-for-you snacking.Nutrient-dense ingredients like plant proteins, prebiotic fibres, and sugar alternatives are gaining centre stage. According to the US Department of Agriculture, nearly 80% of US adults use the Nutrition Facts panel on food labels in buying decisions.

This article captures a pivotal moment in the evolution of snacking—from passive indulgence to active wellness strategy. The shift is no longer about what snacks lack (fat, sugar, calories), but what they contribute: metabolic health, digestive support, emotional balance, and even alignment with pharmacological trends like GLP-1.

What's especially notable is how ingredient innovation is converging with digital tools and consumer psychology: Prebiotic fibres are being positioned not just for gut health, but as functional agents that may enhance GLP-1 secretion, linking snacking to appetite regulation, immunity, and muscle function. This reframes fibre as a metabolic modulator, not just a digestive aid.
The rise of hybrid protein systems—plant, animal, and fermentation-derived—signals a move toward personalized protein architecture. Texture remains a challenge, but companies are deploying modulators and specialty starches to overcome off-notes and mouthfeel degradation.

Samyang's 3S Sugar Reduction Solution and ADM's use of e-tongue and GC-O exemplify how machine learning and sensory analytics are accelerating R&D cycles. These tools allow for rapid iteration of recipes tailored to calorie targets, cost constraints, and sensory expectations.

Reformulating nostalgic flavours with global culinary influences—while embedding functional benefits—reflects a deeper emotional engagement. Snacks are becoming vehicles for comfort, identity, and cultural storytelling, not just nutrient delivery.

Vegan, gluten-free, and clean label are now table stakes. The competitive edge lies in multifunctionality, personalization, and traceable health outcomes.This convergence of metabolic science, sensory design, and digital precision is reshaping the snacking landscape into a platform for proactive health management.

https://www.foodingredientsfirst.com/news/healthy-snacking-trends-protein-ai.html

Tech Gaps and Outdated Systems Stifle Industry Potential

AI and digital tools are fuelling F&B innovation, helping brands speed R&D, streamline compliance, and uncover insights amid economic uncertainty and supply chain volatility.

But while NPD investment is rising, a report reveals that outdated manual systems continue to hold innovation back. Despite 83% of brands planning to boost NPD this year, only 2% say their product development processes are "fully digitized," which provides compliance, quality, and innovation solutions for the F&B industry.

https://www.foodingredientsfirst.com/news/fnb-digital-divide-ai-innovation.html

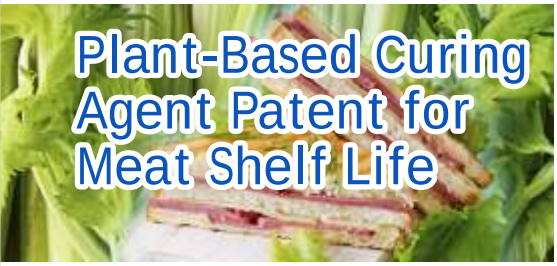
The bottleneck isn't just technological; it's structural. Spreadsheets, while flexible for formulation, falter in collaboration, version control, and AI integration.

This fragmentation limits the scalability of innovation and undermines traceability, compliance, and responsiveness to supply chain volatility.

Three key AI use cases are emerging as high-impact: Ingredient sourcing: AI can identify alternative suppliers and ingredients, mitigating risk and enhancing agility. Formulation optimization: Multi-objective scenarios—balancing nutrition, cost, sensory attributes—can be solved faster and more precisely. Data extraction: AI accelerates digitization by parsing legacy documents, enabling integration across NPD, regulatory, and quality systems.

Yet adoption remains uneven. While 17% of companies are "all in" on AI, 36% still don't use it at all. Most investments are reactive—focused on short-term risk mitigation—rather than strategic, future-proofing moves. This leaves the industry vulnerable to widening gaps in innovation capacity, regulatory agility, and consumer trust.

Unless the F&B sector collectively addresses the digital divide, it risks not only falling behind in innovation but also compromising public health and sustainability goals.



Plant-Based Curing Agent Patent for Meat Shelf Life

Kerry has successfully defended the patent for its natural curing agent Accel, which delivers natural colour, flavour, and texture in meat products while supporting freshness and shelf life. After a successful appeal, the US Federal Court confirmed plant-based curing patent, granted in 2021, remains "wholly valid and enforceable."

https://www.foodingredientsfirst.com/news/kerry-accel-natural-meat-curing.html

Accel is designed to replace synthetic sodium nitrite—long scrutinized for its potential health risks—with a natural alternative that mimics its functional properties. It delivers the traditional pink colour, cured flavour, and extended shelf life associated with nitrite-cured meats, but with the added benefit of supporting naturality claims.

This aligns with growing consumer demand for recognizable ingredients and reduced reliance on artificial preservatives.

What's particularly notable is how Accel integrates into a broader clean label ecosystem. The curing agent pairs with antimicrobial and antioxidant systems like IsoAge, Nourishield, and FoodGard, enabling manufacturers to formulate nitrite-free products that are microbiologically safe and organoleptically stable. The company's proprietary microbial modelling and shelf life studies further reinforce its technical leadership in natural preservation.

From a regulatory and market standpoint, Accel's validation offers several implications:It strengthens the case for natural curing agents in jurisdictions tightening nitrite regulations (e.g., EU, US, Australia).It supports reformulation strategies for processed meats seeking "no added nitrites" or "naturally cured" claims.It may influence Codex and FSANZ discussions around permissible curing agents and labelling standards.

Post-Harvest Technology to Cut Mango Waste and Improve Cold Storage Viability

Dipping mangoes in ozonated water (aqueous ozonation) for ten minutes before storing can extend the cold storage life by up to two weeks, according to Australia's Edith Cowan University research.

The findings can bolster food waste reduction approaches and trade practices, given a global rise in the consumption of fruits and vegetables, the researchers note.The study, led by ECU School of Science lecturer Dr. Mekhala Vithana, notes that the method also recorded significantly lower occurrences of chilling injury.

https://www.foodingredientsfirst.com/news/mango-waste-cold-storage-ozonation.html

This study introduces a promising post-harvest intervention that could reshape mango supply chains and reduce food waste.

By dipping mangoes in ozonated water for ten minutes—a process known as aqueous ozonation— researchers extended the cold storage life of Kensington Pride mangoes by up to 28 days, while reducing chilling injury by 40%. This is particularly significant given that chilling injury, a physiological disorder triggered when tropical fruits are stored below 12.5 C, has long constrained cold chain optimization for mangoes.

The implications are multifaceted. With approximately 20% of Australian mango production lost to spoilage and horticultural produce accounting for half of the country's food waste, this technology offers a scalable, eco-friendly solution. It also addresses a key bottleneck in export logistics, where quarantine heat treatments and hydrocooling steps could be integrated with ozonation to enhance shelf life without compromising fruit quality.

Ozonation itself is not novel in food sanitation, but its application here is notable for its simplicity, cost-effectiveness, and compatibility with existing workflows. The process is safe at threshold levels and decomposes rapidly into oxygen, making it suitable for on-site use.

The study lays the groundwork for broader varietal testing, which could further validate the technology's utility across diverse growing regions and market channels.

Sustainable Rice Production with AI and Farmer Training Collaboration

Beneo has launched a three-year sustainable rice farming project in Vietnam.

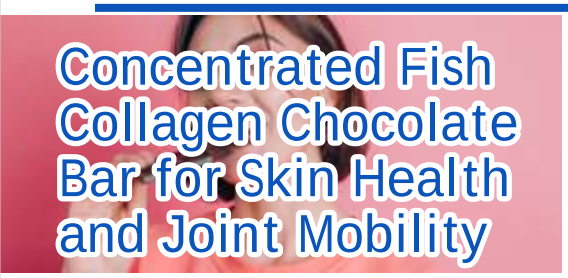
Launched in collaboration with international NGO Rikolto and climate technology firm CarbonFarm, the initiative addresses methane emissions and water usage challenges in the region's rice industry.Vietnam, a major rice exporter, relies on rice for economic stability and food security. However, inefficient water use, excessive fertilizers, and rice residue burning lead to soil degradation, biodiversity loss, and increased greenhouse gas (GHG) emissions.

By training 1,000 farmers in the Mekong Delta on Sustainable Rice Platform (SRP) standards, the project aims to reduce GHG emissions by nearly half and cut water usage by 30% without compromising yield. Demonstration fields will showcase practical applications, while CarbonFarm's satellite and AI tools will enable remote verification of sustainable practices, replacing costly field inspections with scalable, transparent MRV systems.

Beneo's role extends beyond agronomic support. It will develop the market for SRP-certified rice ingredients, processing the sustainably grown rice into starch, flour, and protein at its Belgium facility for use in food and pet food applications.

This creates a closed-loop value chain that incentivizes farmers, supports cooperatives, and documents successful business cases to inspire broader adoption.
The project exemplifies how digital tools, farmer training, and ingredient innovation can be integrated to transform staple crop systems.

https://www.foodingredientsfirst.com/news/beneo-sustainable-rice-climate-resilience.html



Concentrated Fish Collagen Chocolate Bar for Skin Health and Joint Mobility

Morikol is a marine collagen tripeptide formula that merges wellness with indulgence. Tripeptides are clinically proven to support skin and joint health at industry-low doses.

DolCas Biotech's development of the Morikol-infused chocolate bar is a compelling example of how functional indulgence is being redefined through precision nutraceutical engineering. By embedding ultra-low molecular weight marine collagen tripeptides into chocolate squares, the company has created a delivery format that is both clinically effective and sensorially appealing — a rare convergence in the collagen category.

Morikol's tripeptides, composed of glycine, proline, and hydroxyproline (GPH), are bioactive structures known to

stimulate collagen synthesis, hyaluronic acid, and ceramide production — all critical for skin barrier integrity and joint lubrication. What sets it apart is its efficacy at a remarkably low dose: just 1g daily for skin benefits and 2g for joint support. This contrasts sharply with conventional collagen formats that typically require 5–10g per day, often delivered through bulky powders or capsules.

The chocolate format is not merely a novelty. It's a strategic pivot toward consumer-friendly supplementation, especially given neutral flavour, high solubility, and absence of fishy aroma — attributes that make it ideal for integration into milk, dark, or white chocolate without compromising taste or texture. Clinical trials reinforce its credibility: a 12-week study on 53 women showed a 10.5-fold improvement in wrinkle scores compared to placebo, while a separate 10-week trial on 64 individuals with mild knee pain demonstrated reduced joint fluid and discomfort.

Mechanistically, the tripeptides are absorbed intact via PEPT1 transporters, enabling direct systemic delivery to target tissues such as skin, bone, and tendons. This is further supported by cell studies showing increased mRNA expression of collagen-related genes, suggesting a robust biological response.

https://www.foodingredientsfirst.com/news/dolcas-biotech-develops-concentrated-fish-collagen-chocolate-bar-to-boost-skin-health-and-joint-mobility.html

Plant-Based Eggs: Ethical Appeals Strong but Taste Remains Key Hurdle

As the global food industry makes strides toward protein diversification while aiming to minimize the meat sector's carbon footprint, a US study highlights that consumers still prefer conventional eggs over plant-based alternatives on food and nutrition attributes.

However, plant-based eggs score higher on environmental impact, animal welfare, and cholesterol content, which may benefit marketing campaigns for companies in the sector.

This study from the University of Illinois Urbana-Champaign and Purdue University offers a nuanced look at consumer behaviour around plant-based eggs—a category still underexplored compared to plant-based meats. While ethical and environmental considerations such as animal welfare, reduced cholesterol, and lower carbon footprint do resonate with consumers, conventional eggs continue to dominate on sensory attributes like taste and appearance. This sensory gap remains the primary barrier to broader adoption.

Using an experimental vignette design, the researchers found that consumers were more receptive to plant-based eggs when used as ingredients in familiar dishes, such as pancakes, rather than as standalone items like scrambled eggs. Price sensitivity also played a role, with lower-priced vegan eggs increasing purchase intent.

Interestingly, the setting—home versus restaurant—did not significantly influence consumer choices, suggesting that product form and familiarity matter more than context.
The findings suggest strategic pathways for foodservice and retail sectors. Incorporating plant-based eggs into traditional breakfast items could ease consumer hesitancy, especially among younger demographics, urban dwellers, and those already familiar with vegan egg products. Prior experience was strongly linked to increased willingness to purchase, reinforcing the importance of trial and exposure.

From a broader perspective, the study underscores the tension between ethical appeal and sensory satisfaction. While consumers are increasingly aware of the environmental and welfare costs of conventional egg production, taste remains a decisive factor. For plant-based egg innovators, this means that replicating the sensory experience of traditional eggs is not just a technical challenge—it's a commercial imperative.

https://www.foodingredientsfirst.com/news/plant-based-eggs-consumer-preference-study.html

REGULATORY NEWS

Packaged Foods in Canada Must Carry New Nutrition Label by Next Year

Health Canada has launched a new nutrition symbol on grocery packages to help consumers identify foods high in saturated fat, sugars, and sodium.

The governmental department hopes the initiative will lower the increasing rates of chronic disease. Manufacturers have until January next year to update their labels, and some products already feature the symbol.

The front-of-package (FOP) label was designed based on study findings and feedback from 14 focus groups in Canada. It complements the Nutrition Facts table and list of ingredients on the package's back or side. A key aspect of this initiative is ensuring consistency in the label's size and placement, making it easily identifiable for consumers.

Set to take full effect by January 2026, the regulation requires packaged foods high in saturated fat, sugars, or sodium to display a standardized FOP label—designed to be simple, visible, and easily understood across varying levels of health literacy.

The symbol's development was grounded in empirical research, including eye-tracking studies and focus group testing across Canada. Participants were tasked with identifying products based on nutritional criteria, and the inclusion of signal phrases like "high in" alongside a visual icon proved effective in guiding healthier selections. Importantly, the label complements existing back-of-pack Nutrition Facts tables, offering a quick visual cue without replacing detailed information.

This initiative is part of Canada's broader Healthy Eating Strategy and draws on lessons from international FOP labelling systems such as Chile's warning labels and the Nutri-Score used in parts of Europe. However, Canada's approach emphasizes clarity and regulatory consistency, with the inclusion of "Health Canada" in the symbol to reinforce trust and authority.

The policy also intersects with Canada's sodium reduction goals. Despite longstanding voluntary targets, industry progress has been deemed "moderate," prompting calls for more assertive measures. A recent study in BMC Public Health estimates that achieving the 2,300 mg/day sodium target could prevent over 380,000 cardiovascular events, underscoring the potential impact of population-level labelling and reformulation strategies.

For manufacturers, the regulation introduces both compliance requirements and reformulation incentives. Products that exceed nutrient thresholds must carry the FOP symbol unless exempt (e.g., single-ingredient foods like butter or sugar). This may drive innovation in lower-sodium, lower-sugar formulations and cleaner labels, particularly as consumer demand for transparency and health-conscious choices continues to rise.

https://www.nutritioninsight.com/news/foods-canada-nutrition-label.html

FDA Calls For "Radical Transparency" In Infant Formula Recalls

The US FDA is urging the nutrition industry to improve product recall communications to better protect infants' and children's well-being.

In its letter, addressed to manufacturers, packers, distributors, exporters, importers, and retailers, the agency seeks to bring greater transparency to chemical contaminants in infant and toddler food products.

The FDA points to improving communications to keep up with developments in

production and distribution channels.

This initiative builds on programs like Operation Stork Speed and the FDA Expert Panel on Infant Formula, and includes plans to launch a centralized, consumer-friendly webpage on FDA.gov. The goal is to streamline access to recall information and chemical contaminant disclosures, particularly for products intended for infants and toddlers.

The agency's framing of this effort as a public-private partnership reflects a broader strategy to enhance traceability and accountability across the supply chain.

However, the push for transparency comes amid criticism. Experts from the Center for Food Safety and the Alliance for Natural Health have raised concerns about regulatory inertia, citing the shutdown of an advisory committee tasked with addressing microbial and heavy metal contamination in formula.

Allegations of conflicts of interest -particularly regarding FDA leadership with prior ties to industry—have further fuelled scrutiny. The FDA's lack of response to petitions on nano-chemical safety adds to the perception of regulatory gaps.

This tension between reform and critique underscores the complexity of infant nutrition governance. While the FDA's transparency push may improve recall responsiveness and consumer trust, it also highlights the need for robust, independent oversight and updated nutrient standards grounded in current science.

https://www.nutritioninsight.com/news/fda-infant-formula-recalls.html

Prebiotic Galacto-Oligosaccharide Gains Australian TGA Approval

Clasado Biosciences has reached a regulatory milestone for its prebiotic galacto-oligosaccharide ingredient, GOS, which is now approved for use in Therapeutic Goods Administration-listed (TGA) products in Australia.

This includes dietary supplements intended for therapeutic purposes, a development set to expand options for Australian consumers seeking gut-focused health solutions.The TGA approval means dietary supplements incorporating GOS can now be marketed under the TGA framework and can refer to a range of permitted health effects.

Clasado Biosciences' regulatory breakthrough with GOS marks a significant expansion of prebiotic innovation into Australia's therapeutic supplement space. With approval from the Therapeutic Goods Administration (TGA), GOS can now be included in TGA-listed products and marketed with permitted health claims—an advancement that elevates its positioning from general food applications under FSANZ to targeted therapeutic use.

This milestone builds on robust scientific foundation, which includes over 125 publications and more than 20 clinical trials. Its low effective dose (starting at 1.37 g/day) and compatibility with synergistic ingredients like Probi Defendum make it highly versatile for formulators aiming to address gut health, immune support, and potentially mood or cognitive function via the microbiome.

https://www.nutritioninsight.com/news/clasado-biosciences-prebiotic-bimuno-gos-australia-tga.html

China Greenlights Sustainable Algae-Derived Omega-3 For Food and Feed

Corbion has secured multiple regulatory approvals from China's General Administration of Customs.

This paves the way for commercializing its sustainable, algae-derived omega-3 docosahexaenoic acid (DHA) solutions in the nation's fast-growing human and animal nutrition segments, where demand for sustainable and traceable ingredients continues to increase.

AlgaVia DHA and AlgaPrime DHA deliver a clean, highly concentrated, and sustainable source of omega-3 DHA.

These solutions are produced on land from microalgae via controlled fermentation using sugar cane and renewable energy, thereby reducing reliance on marine resources and carbon footprint.

Produced via controlled fermentation of microalgae using sugarcane and renewable energy, these ingredients offer a marine-free, traceable alternative to fish oil—addressing both ecological concerns and supply chain volatility. The approval comes at a time when global omega-3 shortages are intensifying due to overfishing, ocean warming, and pollution, with 85% of the global population reportedly deficient in omega-3 intake.

Corbion's DHA solutions are available in powder, oil, and liquid suspension formats, enabling broad application in aquafeed, livestock, pet nutrition, and plant-based human supplements. Their relevance is further amplified by emerging clinical evidence, such as a Swiss study showing that daily omega-3 supplementation may slow biological aging by up to 3.8 months over three years.Together, these developments reinforce algae-derived DHA's role in advancing sustainable nutrition and functional health innovation.

https://www.nutritioninsight.com/news/corbion-algae-omega3-dha-pet-food-livestock-nutrition.html

FDA Accelerates Natural Dye Adoption with Gardenia Blue Approval

The US Food and Drug Administration (FDA) has approved the gardenia (genipin) blue as a new colour additive for various food products, marking the fourth natural colour approved in the past two months.

The colour, derived from the gardenia fruit, can now be used in sports drinks, flavoured or enhanced non-carbonated water, fruit drinks, ready-to-drink teas, and candies.

https://www.foodingredientsfirst.com/news/fda-approves-gardenia-blue-natural-food-color.html

The FDA's approval of gardenia (genipin) blue as a food colour additive marks a significant regulatory and industry shift toward natural dyes. Derived from the gardenia fruit, this colorant is now permitted in a range of products including sports drinks, flavoured waters, teas, and candies, provided usage aligns with good manufacturing practices.

It's the fourth natural colour approved in just two months, following galdieria extract blue, butterfly pea flower extract, and calcium phosphate—signalling an accelerated push to diversify the palette of nature-derived colorants available to manufacturers.

This move is part of a broader initiative led by the US Department of Health and Human Services to phase out petroleum-based synthetic dyes, particularly in products consumed by children. The Secretary emphasized the health risks posed by synthetic chemicals in food and framed the approval as a step toward prioritizing child health. The FDA has also urged manufacturers to expedite the removal of FD&C Red No. 3 ahead of its 2027 deadline, reinforcing its commitment to the "Make America Healthy Again" campaign.

Industry response has been swift, with approximately 40% of food companies committing to eliminate synthetic dyes since the initiative's launch in April. Consumer Brands, a major trade association, has pledged to remove FD&C colours from school food products by the 2026–2027 academic year.

This regulatory momentum not only reflects growing consumer demand for clean-label and health-conscious formulations but also opens new pathways for innovation in food and beverage coloration.

Nutrition And Public Health Groups Advocate for Stronger FOP Food Labels

PFNDAI Sep 2025

A coalition of 28 consumer, public health, and nutrition groups, along with 12 academic researchers, have submitted joint comments to the US FDA regarding its front-of-pack (FOP) nutrition labelling proposal.The groups are advocating for a mandatory, interpretive labelling system that would highlight levels of added sugars, sodium, and saturated fat in packaged foods.

This coalition-led push for stronger front-of-pack (FOP) nutrition labelling in the US reflects a growing consensus among public health advocates that interpretive, mandatory labels are essential for tackling diet-related disease. The FDA's proposed "Nutrition Info box," introduced in January 2025, would classify packaged foods as "high," "med," or "low" in added sugars, sodium, and saturated fat—nutrients closely linked to chronic conditions like hypertension and cardiovascular disease. It's designed to complement the existing Nutrition Facts panel by offering simplified, at-a-glance guidance for consumers aged four and older.

The coalition, comprising 28 organizations and 12 academic researchers, is urging the FDA to go further. Their recommendations include clearer visual cues—such as exclamation mark icons—to flag high levels of concern nutrients, mandatory disclosure of non-nutritive sweeteners (especially in products marketed to children), and expansion of the policy to include foods for infants and toddlers. They also emphasize the need for a robust consumer education campaign to ensure the labelling system translates into meaningful behaviour change.

This advocacy comes amid mounting evidence that voluntary systems like "Facts Up Front" fail to influence consumer choices. In contrast, "High In"-style labels have been shown to improve purchasing decisions, encourage reformulation, and reduce mortality from diet-related illnesses. The FDA has extended the comment period until July 15, and while the government has yet to finalize the rule, officials maintain that FOP labelling remains a priority.

https://www.foodingredientsfirst.com/news/us-fda-front-of-package-food-labeling-health.html

FDA Plans to Revoke 52 "Antiquated Food Standards"

The US FDA is proposing to revoke 52 "obsolete standards of identity for food products" after concluding they are unnecessary and outdated.

The standards apply to canned fruits and vegetables, dairy products, baked goods, macaroni products, and other foods.

The FDA proposals follow the first results from the agency's ongoing analysis of its portfolio of over 250 food Standards of Identity to ensure they are useful, relevant, and serve consumers in the best possible way.

This deregulatory move aligns with broader efforts to streamline food regulations and reallocate agency resources toward more pressing public health concerns. Health and Human Services Secretary framed the initiative as a push to eliminate bureaucratic red tape and enhance transparency, while FDA Commissioner emphasized that many of these standards now hinder innovation and fail to serve their original protective purpose.

Among the proposed revocations are standards for 11 types of canned fruits and vegetables—many no longer commercially available—including seven involving saccharin-based sweetening.

The FDA also aims to eliminate standards for 18 dairy products and 23 additional food categories, such as bakery items, noodles, canned juices, fish, and dressings.

These changes are expected to give manufacturers greater flexibility in formulation and labelling, potentially paving the way for healthier, more diverse, and more sustainable product development.

https://www.foodingredientsfirst.com/news/fda-revokes-antiquated-food-standards.html

Plant-Based Labelling - EC Draft Regulation Targets 29 "Meat-Related" Terms

The European Commission (EC) has proposed new restrictions on the use of traditional meat-related terms by plant-based food products, reigniting a contentious debate in the food industry over labelling, transparency, and innovation.

The draft regulation — part of a revision of the Common Market Organization Regulation to

amend Regulation No 1308/2013 — seeks to ban 29 "meat" specific terms.

"Specific legal provisions should be introduced to protect meat-related terms in order to enhance transparency in the internal market as regards food composition and nutritional content and ensure that consumers can make well-informed choices, particularly for those seeking a specific nutritional content that is traditionally associated with meat products," the proposal reads.

The proposal, defines meat strictly as "the edible parts of an animal" and seeks to reserve terms like "bacon," "sirloin," "drumstick," and "ribeye" exclusively for animal-derived products. The stated aim is to protect cultural significance and ensure consumers can make informed nutritional choices.

However, the European Vegetarian Union (EVU) and other critics argue that this move contradicts previous rulings by the European Court of Justice, which found existing legislation sufficient to prevent consumer confusion. Current EU rules already allow plant-based products to use meat-related terms if clearly labelled as meat-free. Data from the European Consumer Organisation suggests that up to 80% of consumers support the continued use of traditional meat terms for plant-based products, provided the plant-based nature is transparent.

The proposal excludes terms like "burger," "sausage," and "steak," which were central to earlier disputes, but a parallel initiative from French MEP Céline Imart may seek to include them in a broader restriction. Critics argue that the EC's move undermines entrepreneurship, innovation, and climate-aligned food strategies, especially given the growing importance of plant-based alternatives in reducing agricultural emissions and diversifying protein sources.

https://www.foodingredientsfirst.com/news/european-commission-plant-based-meat-terms-ban.html

European Commission Greenlights Genetically Modified Soybean

The European Commission (EC) has authorized a new genetically modified (GM) soybean variety for use in food and animal feed.

This follows the European Food Safety Authority's scientific assessment that the soybean is "as safe as its conventional counterpart." The authorization is valid for 10 years. The EC's decision only allows this GM soybean to be imported for use in food and animal feed, but not to be cultivated in the EU. While cultivation remains prohibited within the bloc, the approval for importation into food and feed channels reflects a pragmatic response to global trade dynamics and scientific consensus on safety.

This GM soybean, originally developed by Monsanto and now managed by Bayer CropScience, features two key traits: herbicide tolerance and a modified fatty acid profile — specifically, increased monounsaturated fats (oleic acid) and reduced polyunsaturated fats (linoleic acid). The European Food Safety Authority (EFSA) concluded that the soybean poses no nutritional concern, aligning with global assessments that have led to approvals in over 70 countries.

However, the EU's regulatory rigor remains evident in its labelling and traceability mandates. Products derived from this soybean must be labelled "not for cultivation" and include a clear statement on the altered fat profile. This compositional change is considered significant enough to warrant specific consumer disclosure, reinforcing the EU's commitment to transparency and informed choice.

The decision also reflects procedural nuance: Member States failed to reach a qualified majority either for or against the authorization, triggering the Commission's legal obligation to act under Regulation (EC) No 1829/2003. This regulatory pathway — often invoked in GMO approvals — underscores the political complexity surrounding biotechnology in Europe.

From a market perspective, the approval may facilitate broader ingredient sourcing for EU food and feed manufacturers, particularly in high-oleic applications where oxidative stability and health claims are desirable. It also aligns with trends in functional formulation, where lipid profiles are increasingly tailored for nutritional and processing benefits.

https://www.foodingredientsfirst.com/news/eu-approves-gm-soybean.html

New Ultra-Processed Food Definition as Consumers Struggle to Identify Them

As ultra-processed foods comprise a considerable share of the US diet, consumers are increasingly aware of their associated health impacts.

However, surveys underscore that consumers struggle to identify ultra-processed foods or to accurately determine which ones are linked to health risks, such as type 2 diabetes.

Although observational research links ultra-processed foods to health issues like obesity or non-communicable diseases, studies that distinguish between different types of foods underscore that not all have an equally adverse impact on health.

This explores the growing concern around ultra-processed foods (UPFs) in the US diet and the widespread confusion among consumers about what these foods are and how they affect health. Despite rising awareness of their links to chronic diseases, many Americans struggle to accurately identify UPFs or understand their varied health impacts.

Surveys reveal that 74% of US adults believe UPFs harm their physical and mental health, yet 63% find it harder to identify UPFs than to file taxes. Only 11% feel confident spotting them on labels. A study by the Physicians Committee for Responsible Medicine found that 39% of respondents mistakenly believed all processed foods are unhealthy. Many incorrectly blamed sugar, desserts, and carbohydrates for increasing diabetes risk, while only 17 out of 2,174 respondents identified processed meats—despite strong evidence linking them to diabetes and cardiovascular disease.

Lead author Dr. Neal Barnard emphasizes that not all UPFs are equal: while processed meats are associated with increased disease risk, plant-based UPFs like breakfast cereals may actually reduce risk. This nuance is often lost in public discourse, contributing to dietary misconceptions and unnecessary restrictions.
The NOVA system, developed in 2010, categorizes foods based on processing levels but has come under scrutiny for its broad and sometimes subjective classifications. Foods like oat milk, protein bars, and plant-based meats are often labelled as ultra-processed, surprising 76% of survey respondents. Critics argue that classification should focus more on biochemical composition and nutritional value than on processing techniques alone.

The Physicians Committee is urging the FDA to develop a scientifically grounded definition of UPFs to reduce confusion and support public health. A Request for Information is expected soon. The American Medical Association has also adopted a policy promoting education on the differences between healthful and harmful UPFs and supporting increased FDA research funding.

While observational studies link UPFs to preventable premature deaths, experts caution that more research is needed to establish causality. The Physicians Committee notes that survey responses are often subjective and disconnected from scientific evidence, reinforcing the need for clearer definitions and public education.

https://www.nutritioninsight.com/news/healthy-ultra-processed-foods-product-label-confusion.html