



PFNDAI

FOOD, NUTRITION & SAFETY MAGAZINE

BULLETIN SEP 2026

'Beyond Sweetness: Science & Innovation In Sugar Reduction'

Ms Sanyukta Telange

**Designing Transparent
Labelling: Navigating the Dynamic
Regulatory Landscape in India**

Ms Shipra Sehgal

**Whole Grains: Promoting
Metabolic Health through Better Nutrition**

Ms Nupur Agarrwal

**The Role of Speciality Oils and
Fats in Healthier Food
Reformulation**

Dr K D Yadav, Dr Konda Reddy Kunduru
& Ms Gauri Iyer

**Millets 2.0: Nutrition, Innovation
& Sustainable Food Systems**

Ms Anuja Padte & Ms Samreen Shaikh

**Dietary Fiber
And Gut Health**

Dr. Malathy Venkatesan

**Zinc:
Small Mineral,
Significant Role**

Ms Simran Vichare

**Seed Oils Demystified:
Safe, Healthy, or Harmful?**

Prof Jagadish Pai

**Report on School Nutrition
Awareness Activity,
TMG School, Thane**

Ms Sanyukta Telange

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INDEX



COVER STORY 1

Fine Organic Industries Ltd,
Food Ingredient Specialities,
Mother Dairy,
Marico,
Vasta Biotech,
Mondelez,
Zyduz Wellness,
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ADM,
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ADVERTISERS

Editorial

Regulatory Viewpoint By Dr Lewis

'Beyond Sweetness: Science and Innovation in 1
Sugar Reduction'
By Ms Sanyukta Telange

Designing Transparent Labelling: Navigating 7
the Dynamic Regulatory Landscape in India
By Ms Shipra Sehgal

Whole Grains: Promoting Metabolic Health 15
Through Better Nutrition
By Ms Nupur Agarwal

The Role of Speciality Oils and Fats in 23
Healthier Food Reformulation
By Dr K D Yadav, Dr Konda Reddy Kunduru & Ms Gauri Iyer

Dietary Fiber and Gut Health 28
By Dr. Malathy Venkatesan

Zinc: Small Mineral, Significant Role 34
By Ms Simran Vichare

Seed Oils Demystified: Safe, Healthy, or Harmful? 40
By Prof Jagadish Pai

Millet 2.0: Nutrition, Innovation & 45
Sustainable Food Systems
By Ms Anuja Padte & Ms Samreen Shaikh

Report on School Nutrition Awareness Activity, 48
TMC School, Thane
By Ms Sanyukta Telange

Regulatory Round Up 52
By Ms Sanyukta Telange

Research in Health & Nutrition 54

Food Science and Industry News 59

Regulatory News 64

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Processing Does Not Make Food Products Unsafe

Yes, there was a time when rapid urbanisation took place in the US over a century ago and as fresh produce would spoil by the time there was an opportunity to preserve them by processing. Many entrepreneurs tried various methods including drying, freezing, canning and using chemical preservatives to extend the shelf life so spoilage and waste could be reduced and preserved food would reach consumers.

At the time safety of some of the processes and substances used in them was not adequately tested so there were cases of food related illness. This led to the government to enact Pure Food & Drug Act that led to the creation of FDA and various other laws in many countries subsequently to ensure safety and purity of foods and products.

Today a large population in India lives in cities and needs foods to be brought from farms

in various forms including processed foods, without which it will not be possible to sustain nourishment of such a large population. Processing is a necessity and not an option today. It must also be realised that most food products that are prepared and sold in the market are safe and healthy.

There are some who may try to cheat on quality and safety of food products, but most of the products available on the shelf of the markets are not adulterated or produced with the intention of causing overconsumption or addiction as some influencers with ulterior motive would like people to believe.

This lobby is creating a narrative they have borrowed from the west and is now trying to make people believe that the entire food industry chain from the farmers to the end-processors are interested only in profiteering from unhealthy addictive food. This is demonising the industry and forcing the regulators to enact laws that would be highly unfair and restrictive to the industry.

By unscientific classification, there is so much of confusion created about processed foods that now people are afraid of anything packaged.

The various methods of processing have been shown to be safe along with all the additives used. All these have been tested and validated over decades, but still doubts have been created with improper epidemiological studies. There are no randomised controlled trials to show that processes as they are used today, the additives used within standards prescribed or substances produced in processing when consumed normally can cause any of the illnesses that are claimed.

There are some who try to profit by adulteration that is being checked by FSSAI and FDA, but these are exceptions and not norms. These offenders must be punished but the influencers are using these instances to tarnish the industry.

**Prof Jagadish Pai, Editor,
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True Safety is Measured by Process, Not Product



AUTHOR

Dr Joseph I Lewis,
Chairman, Scientific Advisory
Committee, PFNDAI

FSSAI's extensive product testing for nonconformity and unsafe food has grown to 4.5 lakh samples (2023-24) across the food processing landscape.

This massive dataset reveals two diagnostic features of food manufacturing: harmless nonconformance at ~20% and unsafe food between 2% and 4%. The conclusion that "96% of the food supply is safe" (PFNDAI, August 2026) is illusory, as it rests on a fundamental misconception about market testing.

True safety does not lie in testing markets for unsafe products, but in preventing

them from entering. This is the central distinction between the reactive behaviour of PFA (1954) and the preventive approach of the Food Safety and Standards Act, 2006. Market inspections generate headlines because they are visible, dramatic, and easy to report. Testing products in the market is a dangerous blind spot of presuming safety (Figure).

While a single box of sweets

picked off the shelf tests positive for microbial pathogens, hundreds from the same batch reach consumers and are consumed. Under a risk-based system, a batch code isn't just a labelling detail but a track-and-trace link.

The moment lab information flags positive pathogen presence, the distribution system tracks every shipment of the offending package to execute a recall.



PREVENTION MUST HAPPEN BEFORE MARKET ENTRY.

Coca-Cola India & Southwest Asia





Safer under FSSA (2006) than PFA (1954)		
Regulatory dimension	How we used to do it (Adulteration Acts)	How we do it now (Risk-based Acts)
Target site	Check marketplace: product focus	Check supply chain: process focus.
The purpose	Catch violation: enforcement	Secure ecosystems: enablement
Triggers (action)	One sample fails the lab test	FSMS malfunction
Philosophy	Reactive... Policing	Preventive....Gatekeeping

Preventive systems, by contrast, work quietly and effectively in the background. No one holds a press conference to say, “Because of rigorous monitoring, surveillance and verification processes, many children did not suffer a stomachache today.”

Yet an unseen structural framework that effectively controls microbial contamination and toxins before products enter the market is the real measure of food safety. However, market testing serves a different purpose.

A 96% baseline indicates that several structural layers of sourcing, manufacturing, processing, and distribution are already in place. If the baseline were closer to 50%, it would imply that raw ingredients were contaminated, substandard, or fraudulent half the time.

The present baseline

establishes system capability; it also exposes the need for a closer look at food risks.

Most countries have moved away from outdated testing systems under Adulteration Acts to modern risk-based platforms. India appears to operate within two regulatory theatres (Table).

One is the visible enforcement model: inspect, test, and prosecute after the product has reached the marketplace; the other is a silent preventive model promised by FSSA, 2006, verifying risk controls across the chain before failure reaches the consumer (Sections 26; 29).

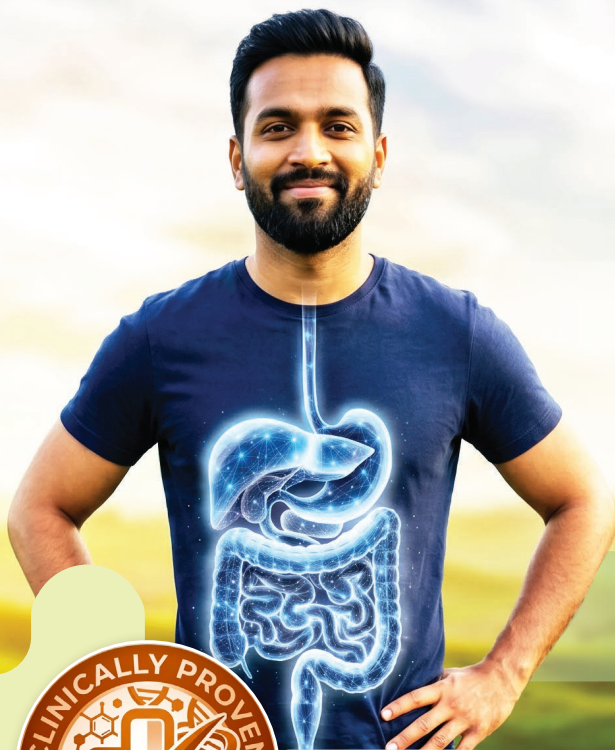
The concern is not the absence of reform on paper, but its weak translation into regulatory practice. While the performative nature of the old PFA model generates immense public drama and political capital, it is inept at toxicological reality.

More than a decade after the FSSA framework came into force, the system behaves like the repealed adulteration inspectorate rather than a modern risk-management authority.

A recent media report (ET, 31 July 2026) noted that NITI Aayog is studying global best practices, farm-to-fork traceability, and stronger monitoring and surveillance oversight. These are not new ideas, but core elements of the twenty-year-old FSSA, 2006.

If NITI Aayog is acknowledging that sporadic market raids cannot deliver safety, it may be pointing to the long-overdue shift to FSSA. India’s food ecosystem is undeniably complex, fragmented, and difficult to supervise. But that complexity cannot remain a permanent explanation for delayed implementation of FSSA’s modern safety framework.





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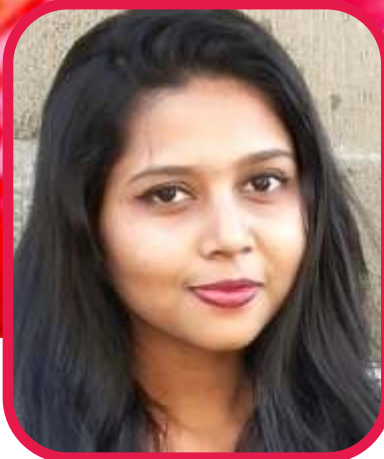


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'Beyond Sweetness: Science & Innovation In Sugar Reduction'



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Sugar is no longer just about sweetness; it has become a key focus for health-conscious consumers and food companies alike. Consumers are increasingly looking for healthier options and are becoming more cautious about added sugars. This has created strong demand for products that offer less sugar without compromising taste, texture or enjoyment. Alternative sweeteners are gaining popularity, while claims such as “sugar-free” and “no added sugar” appear frequently.

Sugar taxes and front-of-pack labelling are also shifting the competitive landscape. Many countries have imposed taxes on sugar-sweetened beverages and have introduced front-of-pack nutrition labelling. Countries are adopting fiscal policies, prompting manufacturers to reduce sugar in their products (1,2).

However, reducing sugar in products removes not just sweetness but also essential functions like bulk, moisture retention, and shelf life. When sugar is decreased, it can lead to a loss of body and flavour. Each product category requires a careful rebalancing of sweetness, flavour, and texture, as higher reductions increase risk. Successful reformulation must address both taste and texture, as

poor mouthfeel or flavour is a major reason for consumer rejection of reduced-sugar products. The challenge, therefore, is to achieve a sweetness experience similar to sugar while maintaining these other functions and keeping the product commercially viable (3).

The Challenge of Sugar Reduction

Reducing sugar in food products can be achieved through various methods, including partial replacement with high-intensity sweeteners, natural sweeteners, rare sugars, polyols, sweet proteins, and other functional ingredients. The best approach to sugar reduction largely depends on the type of product and the specific roles sugar plays within it.

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For example, reducing sugar in beverages is generally simpler because sweetness is their primary function. In contrast, reducing sugar in foods such as baked goods, candies, and dairy products is more complex, as sugar not only adds sweetness but also contributes to bulk, moisture retention, texture, colour development, and the overall structure of the product. Recreating sugar's roles in terms of texture, browning, and stability is particularly challenging. It requires a combination of ingredients tailored to replicate the specific functions of sugar in the product. These challenges have increased interest in alternative ingredients that can provide both sweetness and some of the functional properties of sugar.

High-intensity sweeteners such as aspartame, acesulfame K and sucralose have therefore been widely used in beverages. However, none provides exactly the same taste as sucrose, and differences in sweetness intensity, aftertaste and flavour profile remain a challenge. Combining sweeteners can help overcome these limitations. Aspartame and acesulfame

K, for example, can work synergistically: aspartame provides a lingering sweetness, while acesulfame K has an aftertaste with bitter/metallic notes, helping to balance the overall taste. Their combination can also improve cost efficiency. However, aspartame has limited stability, which can create shelf-life challenges. Sucralose is more stable and can also be combined with acesulfame K to improve sweetness while reducing formulation costs (1).

Sugar can also contribute to colour in some beverages, so reducing or removing it may require the use of colourants to reproduce the original visual appearance. Similar challenges can occur in other food products, where sugar contributes to browning, texture and structure during processing. Therefore, the choice of sugar-reduction strategy needs to consider more than sweetness alone. A technically successful sugar reduction may still fail if the resulting taste does not meet expectations.

Novel ingredients as sweeteners

A wide range of alternative sweeteners are available for sugar reduction. Many high-intensity sweeteners are substantially sweeter than sucrose and are therefore

used only in small amounts. Natural high-intensity sweeteners such as stevia and monk fruit, along with polyols, are important tools for sugar reduction. Sweet proteins like brazzein are an emerging solution for reducing sugar in food products due to their intense sweetness. Precision fermentation also produces these proteins and rare steviol glycosides on a large scale, offering new opportunities for sugar reduction (1).

Rare sugars, in particular, have attracted attention because of their potential combination of favourable sensory and functional properties. Unlike high-intensity sweeteners, some rare sugars can contribute to the physical properties of a food while also providing sweetness, making them promising alternatives for more sugar-reduction strategies. Enzyme technology offers another approach. For example, enzymes can break lactose in milk into glucose and galactose, increasing sweetness naturally without adding a sweetener.

Newer innovations are also using enzymatic bioconversion to create functional sweeteners. One example is Keto-Fructose (5-Dehydro-D-fructose, or 5-KDF), which is developed to provide not only sweetness

but also sugar-like functions such as browning, bulk, texture and baking stability. Safety studies published by Fooditive found no intrinsic genotoxic or cytotoxic effects under the stated test conditions, and the ingredient has a GRAS notification under FDA review (4).

Trehalose is also gaining interest because it can replace some of the functions lost when sugar is reduced. It is naturally found in small amounts in mushrooms, yeast, honey, and some insects, but commercial production relies on enzymatic conversion of starch from sources such as corn or tapioca. The process recreates the same trehalose molecule found in nature, but in a form that's consistent, food-safe and suitable for large-scale use. One of the proposed biological roles of trehalose is that it can potentially stabilize blood sugar levels through slower blood glucose release and a milder insulin response compared to other monosaccharides and disaccharides (9). Although it is only about 45–50% as sweet as sucrose, it binds water, stabilises proteins and fats, and helps maintain texture and structure during heating, drying and freezing. It can also help maintain softness, prevent ice crystal growth and stabilise sensitive

ingredients while masking unwanted flavours. It is already used in premium bakery, confectionery and specialised nutrition products, and could move into more mainstream applications as costs fall.

Allulose, also known as D-allulose, is a promising rare sugar for sugar reduction. It provides a taste closer to sucrose while contributing very few calories. Allulose occurs naturally in small amounts in foods such as figs, raisins, kiwi and maple syrup, although it is isolated and produced at scale for food applications. With approximately 70% of the sweetness of sucrose, D-allulose has attracted interest as a sugar-reduction ingredient. It also has useful functional properties, including its ability to participate in browning and Maillard reactions, which can make it suitable for a range of food formulations. Its relatively sugar-like taste and functional properties have increased interest in its use in products such as cereals, protein products and dairy products (5).

Like D-allulose, D-tagatose is another rare sugar receiving attention both for its production and potential health effects. D-tagatose is a monosaccharide that has been known since the 1980s; advances in research



and development have enabled large-scale production, allowing it to enter the market more widely. It is approximately 92% as sweet as sucrose and provides fewer calories. In addition to its sweetness, tagatose is attracting interest because of its potential functional benefits. It is being positioned not only as a sweetening ingredient but also as a prebiotic (6).

Consumer acceptance of natural sweeteners

Consumer acceptance is an important factor in the successful development of reduced-sugar products. Natural sweeteners are gaining interest because consumers often associate naturally derived ingredients with healthier and more desirable products. However, the perception of naturalness alone does not guarantee acceptance. Taste remains one of the most important factors influencing consumer liking and purchase decisions, and consumers generally expect reduced-sugar products to provide a sensory experience similar to that of conventional sugar-sweetened products.

Consumers may prefer products labelled as “naturally sweetened”, but differences in sweetness, flavour and aftertaste can still affect acceptance when the products are actually tasted. For example, a study on sweeteners in yoghurt found that consumers preferred the “naturally sweetened” claim conceptually, but taste remained the most important factor in their acceptance. Although sugar-sweetened yoghurt was preferred overall, yoghurts containing a combination of allulose, stevia and sucrose were liked more than those containing stevia alone. This suggests that allulose may help reduce sugar while maintaining a more acceptable taste (7).

Consumer expectations also extend to the cost and overall eating experience of alternative sweeteners. A recent study found that 63.6% of consumers disliked the taste of alternative sweeteners and expected a taste similar to sugar at an affordable price. However, when a prototype containing erythritol, stevia and sucralose was compared with sugar in snacks and beverages, there was no significant difference in overall liking. These findings suggest that consumers may be willing to accept

alternative sweeteners when they can provide a familiar taste at a reasonable cost (8).

Overall, consumer acceptance presents both a challenge and an opportunity for sugar reduction. Consumers may be attracted to products with natural or reduced-sugar positioning, but long-term acceptance depends on whether these products deliver the taste, flavour and texture that consumers expect.

In conclusion, sugar reduction is beyond replacing sweetness; it is about recreating the taste, texture and functionality that consumers expect. With advances in sweeteners, rare sugars, enzymes and novel ingredients, continued innovation can help deliver reduced-sugar products that are both successful and enjoyable to consumers.

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Designing Transparent Labelling: Navigating the Dynamic Regulatory Landscape in India



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TRANSPARENT LABELS: WHY IS IT IMPORTANT?

“Food Choice is Multifaceted, Contextual, Dynamic, Multilevel, Integrated, and Diverse¹”.

The topic of consumer food choice has received much attention among researchers and stakeholders within the

food industry.

A study² conducted to Understand Consumer's purchase intention, found that Product Information was one of the key determinants influencing consumer's choice to purchase and consume convenience food.

Hence it is important that consumers are getting sufficient product information. The primary responsibility of providing relevant information to consumers lies with regulators and

organizations. Proper labelling ensures that consumers receive the necessary details to make informed choices about the food.

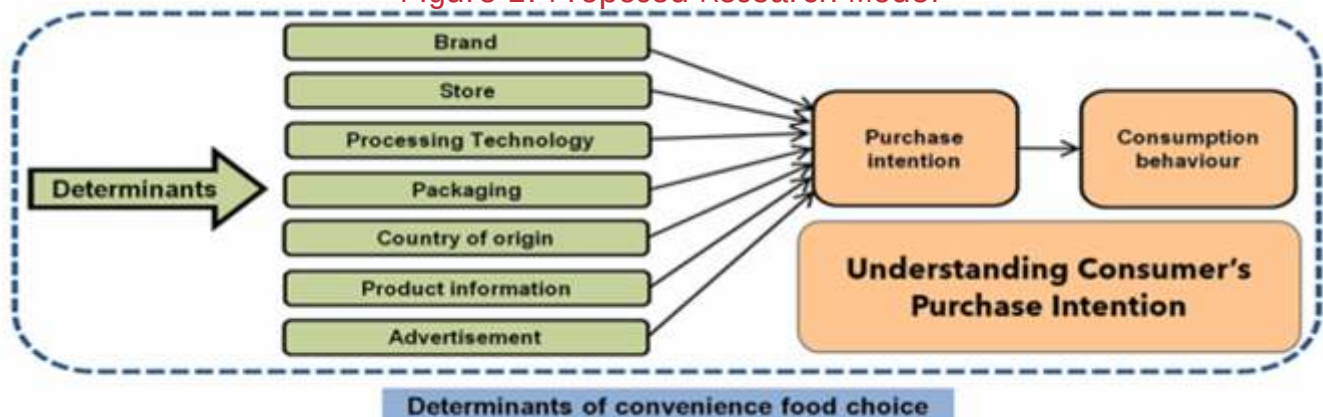
Key Responsibilities:

- Regulators ensure that labelling regulations are in place and enforced.
- Organizations are responsible for providing clear and accurate information.

INDIA'S REGULATORY FRAMEWORK

India's packaged food regulatory landscape is

Figure 1: Proposed Research Model²





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*'Strength Nutrients' refers to Vitamin D, Iron, Zinc, Vitamin A, B12, C. '2x Strength Nutrients' is based on 2 serves of Bournvita (40g) with 400 ml cow's milk vs 400ml plain cow's milk. Nutrient values are from IFCT, NIN 2017. Refer to pack for more details.



uniquely complex, requiring simultaneous compliance across three separate ministries rather than a single food authority.

The Food Safety and Standards Authority of India (FSSAI), under the Ministry of Health & Family Welfare, governs food safety, quality, and labelling through the FSS (Labelling and Display) Regulations, 2020³ and FSS (Advertising & Claims) Regulations, 2018⁴. These regulations mandate declarations including product name, ingredients, nutritional information, allergen declarations, country of origin, veg/non-veg symbols, FSSAI licence number, and batch identification.

Simultaneously, the Legal Metrology division under the Ministry of Consumer Affairs administers the Packaged Commodities Rules⁵, 2011, requiring additional mandatory declarations including manufacturer details, net quantity, MRP, date of manufacture, and consumer care information. Adding another layer of complexity, the Ministry of Environment, Forest & Climate Change enforces the Plastic Waste Management Rules⁶ through

the CPCB, mandating Extended Producer Responsibility (EPR) registration, annual recycling targets, and mandatory recycling code labelling on all plastic packaging.

Food businesses must satisfy all three regulatory streams simultaneously, with each ministry maintaining independent enforcement mechanisms and penalty frameworks.

MANDATORY LABELLING REQUIREMENTS

“Labelling” means any written, printed or graphic matter that is present on the label, accompanies the food or is displayed near the food (As defined in Food Safety and Standards (Labelling and Display) Regulations, 2020³).

Essential Label Components:

- **Name of the Food:** Every package of food shall carry name of the food which indicate the true nature of the food contained in the package.
- **Ingredients Information:** Every Packed Food Except for single ingredient foods, declares a list of ingredients on the label. This lists all the ingredients that are used in the manufacture of food in descending order of their composition by weight or volume.

The list of ingredients information additionally includes about additives used in the product, the additive usage is set by Food Safety and Standards Authority of India as they define standards for the different food products. Authority further regulates usage of additives into different food categories along with its maximum limit. Additives safety assessment is mandated by scientific bodies like Joint FAO/WHO Expert Committee on Food Additives (JECFA), European Food Safety Authority (EFSA). These scientific bodies evaluate the safety of food additives for human consumption basis risk assessment / safety evaluation and exposure assessment.

- **Allergens Information:** FSSAI also mandates to declare the 8 major ingredients that trigger food allergies. The identified food allergens are Cereals containing gluten, Crustacean, Milk, Egg, Fish, Peanuts and tree nuts, Soyabeans and Sulphite. The direct presence of the allergens is provided on the label by statement “Contains” and there is additional layer of assurance which indicates presence of ingredients due to cross contamination which are known to cause allergy to be declared separately as “May Contains”.

➤ Nutritional Information:

Every Packed Food Label provides access to information about its nutritional quality for the parameters as defined in labelling regulations³ by FSSAI. The labelling regulation³ was extensively reviewed in 2020 and now elaborated Nutritional Information requirements are provided on the labels. The Nutrition Information provides important information about the calorie content, Macronutrients (Carbohydrates including Total Sugars & Added Sugars, Total Fat, Saturated Fat and Trans Fat, Protein) and Micronutrients content (if the food claimed to be enriched with nutrients). Additionally, Cholesterol & sodium are also required to be labelled.

Nutritional Information Per 100g or 100 ml and per serve of the product (unless otherwise exempted from the regulations) is provided and includes following:

➤ Serving size* and number of servings in a pack.

➤ Per serve percentage (%) contribution to RDA** calculated on the basis of 2000 kcal energy, 67 g total fat, 22 g saturated fat, 2 g trans fat, 50 g added sugars and 2000 mg of sodium (5 g salt) requirement for average adult per day.

**Serve Size: means an amount of food customarily consumed per eating occasion or as defined on*

the label which is expressed in metric unit.

***RDA (Recommended dietary allowances) typically means the average daily dietary nutrient intake level sufficient to meet the nutrient requirement of nearly all (97 to 98 per cent.) healthy individuals in a particular life stage and gender group.”*

Declared nutrition values should be supported by product formulation, validated calculations and/or testing, as appropriate. Where tolerance limits apply, they should be assessed across the declared shelf life and in line with FSSAI guidance and enforcement expectations. As per FSSAI labelling and Display Regulations requirements, a criterion for Tolerance Limit is set at Maximum minus 10% of declared nutrient value.

➤ Veg & Non-Veg Declaration:

Every packed food must declare vegetarian or non-vegetarian status and declaration is made by a symbol and colour code as stipulated below.



• Additional Declaration:

Certain ingredients or additives like Polyols, sweeteners, Polydextrose etc. require specific label declarations in a manner defined by regulation.

- For example, products containing 10% or more polyols or polydextrose require the declaration “Polyols/Polydextrose may have laxative effect”. Non-caloric sweetener declarations must be applied exactly as prescribed for the relevant sweetener and product category.

➤ Other Declarations: other information like Date Marking, Batch or Lot Number, Storage & Instructions for Use, Net Quantity, FSSAI Logo and License Number, Name & Address of Brand Owner / Manufacturer / Marketer / Packer or bottler etc. are also needed to be declared.

➤ Consumer Care Details is another requirement from legal metrology act which is required to be labelled.



LABEL CLAIMS ARE REGULATED

The Food Safety and Standards (Advertising and Claims) Regulations, 2018⁴ defines

CLAIM: any representation, whether printed, oral, audio or visual, that states, suggests or implies that a food has particular qualities relating to its origin, nutritional properties,

nature, processing, composition or otherwise⁴.

ADVERTISEMENT: "advertisement" means any audio or visual publicity, representation or pronouncement made by means of any light, sound, smoke, gas, print, electronic media, internet or website and includes any notice, circular, label, wrapper, or other documents

Claims should be truthful, not misleading, capable of substantiation and aligned with the conditions prescribed in the regulation.

Criteria As per FSSAI regulation:

FBOs making claims need to assure: The claim that a food has certain nutritional or health attributes shall be scientifically substantiated by validated methods of characterizing or quantifying the ingredient or substance that is the basis for the claim.

Validation of claims: Claim substantiation should include product construct, relevant testing where required, validated methods for characterising or quantifying the ingredient or nutrient, scientific and technical rationale, and periodic review when regulations, formulation or scientific understanding changes.

Claim type	Regulatory meaning and discipline
Nutrient content claims	Describe the level of a nutrient in the product, such as "source of", "high", "low" or "free", subject to prescribed thresholds. Example: "Source Claims": Vitamins & minerals 15%RDA "Low Sugar": This indicates that the product contains not more than 5 g of sugars per 100g for solids, or 2.5 g of sugars per 100ml for liquids.
Comparative claims	Compare the nutrient level of two or more foods. The comparison must meet applicable conditions, including meaningful difference and appropriate reference food. For Macro nutrients the difference should be at least 25% when compared.
Equivalence claims	Describe that the food contains the same amount of a nutrient or is an equivalent source compared with a reference food.
Non-addition claims	Cover non-addition of sugars, sodium salts or additives where prescribed conditions are met. Example: "No Added Sugar": This indicates that no sugars have been added to the product during processing. However, it may still contain naturally occurring sugars and in such case the following indication shall also appear on the label. 'CONTAINS NATURALLY OCCURRING SUGARS'
Health claims	Include nutrient function claims, other function claims and reduction of disease risk claims. These require a higher level of scientific substantiation.



CRUNCH
CRUNCH
Mmmmmmmmm



No.	Principle	Application
1	Legibility and visibility	Use compliant language, font size, contrast and placement. Information should be clear, prominent, indelible and readily legible.
2	Accuracy and truthfulness	Ensure nutrition values, ingredients, claims and declarations are supported and do not mislead.
3	Completeness and fair representation	Include all mandatory information without creating an erroneous impression of product character.
4	Clarity and physical presentation	Use consumer-friendly wording where possible. Apply labels securely so information does not separate from the container.
5	Consistency and accessibility	Standardise information architecture across the portfolio while maintaining product-specific accuracy.
6	Digital integration	Use QR codes and digital tools to provide extended information without replacing mandatory on-pack declarations.

DESIGNING TRANSPARENT LABELS

A transparent label should satisfy both regulatory compliance and consumer usability. Compliance answers the question “Is the required information present?” Transparency goes further and asks “Can a consumer notice it, read it, understand it and trust it?”



NAVIGATING CHANGE: CHALLENGES AND OPPORTUNITIES

Transparent labelling is becoming more demanding because labels now carry food safety, nutrition, consumer protection, environmental, channel and claims information at the same time. The challenge is not only to add more information, but to govern it better.

Key challenge	Practical opportunity
Frequent regulatory amendments requiring rapid artwork updates	Technology-Enabled Compliance AI-driven regulatory monitoring, digital labelling tools and other technology can be integrated for artwork approvals and proactive regulations assessment.
Multiple regulatory streams covering labelling, claims, packaging and digital sale channels	Integrated Label Review Covering FSSAI, Legal Metrology, packaging /EPR and e-commerce requirements
Limited pack space and increasing mandatory declarations	Smart/Digital Labelling QR-enabled extended information and stronger front/back-of-pack information architecture
Addressing misinformation and consumer confusion	Consumer Education Labelling complemented by consumer awareness programs
Portfolio complexity across categories and pack formats	Technology-Enabled Compliance Centralized label governance, Template governance and periodic compliance audits

CONCLUSIONS

- Design labels with the consumer at the centre.
- Treat transparent labelling as a shared responsibility between regulators, food businesses and consumers.
- Stay ahead of regulatory changes through proactive monitoring and structured artwork governance.
- Use a science-based approach for claims, nutrition communication and ingredient-related declarations.
- Use technology for compliance efficiency, digital access and consumer engagement.

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(The views, opinions and information expressed in this article are solely my personal views. Shipra Sehgal)



Whole Grains: Promoting Metabolic Health through Better Nutrition



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Introduction

Metabolic health is the body's ability to efficiently produce energy, absorb and utilize nutrients, and maintain internal balance (homeostasis). It is commonly assessed using the five components of metabolic syndrome: increased waist circumference, reduced high-density lipoprotein cholesterol (HDL-C), elevated triglycerides, elevated blood pressure and elevated fasting glucose. The coexistence of these abnormalities indicates impaired metabolic regulation and predicts a higher risk of type 2 diabetes and cardiovascular diseases [1,2].

Dietary carbohydrate quality is relevant to this metabolic

framework because cereals constitute a major component of habitual diets, particularly in India. However, the metabolic effect of a cereal food cannot be predicted solely from its carbohydrate content. Grain structure, source, variety, particle size, fibre type, processing, cooking and the composition of the complete meal influence nutrient digestibility and postprandial response. Whole grains are of particular interest because retention of the bran, germ and endosperm preserves a structural and nutrient matrix that is partly lost during refining.

Definition and composition of whole grains

Whole grains shall consist of the intact, ground, cracked, flaked or otherwise processed kernel after the removal of inedible parts

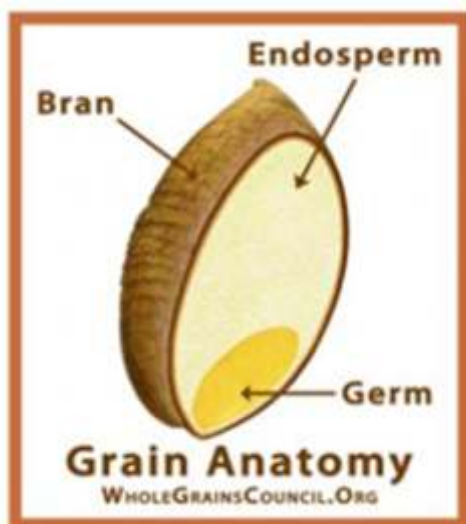
such as the hull and husk. All anatomical components, including the endosperm, germ, and bran must be present in the same relative proportions as in the intact kernel. Any allowable removal of components during processing should be evidence-based and kept to a minimum. Whole grains include whole wheat, oats, barley, maize, brown rice and millets such as ragi, jowar and bajra. Pseudocereals, including amaranth, quinoa and buckwheat, are commonly considered alongside whole grains because they are used in similar dietary contexts. Oilseeds, pulses and legumes are anatomically and compositionally distinct from cereal grains. Consequently, they are not classified as whole grains and are not included in definitions or dietary intake recommendations specific to whole grains [3].



AASHIRVAAD



Creative visualization



Structure of a whole grain kernel showing bran, germ and endosperm. Adapted from Whole Grains Council [12]

The bran is the multilayered outer covering of the grain and is rich in dietary fibre, minerals, vitamins and bioactive compounds, particularly phenolic acids, which are phytochemicals with potential health-promoting properties. *The germ* is the embryonic portion of the grain and contains essential fatty acids, B vitamins, vitamin E, selenium and other antioxidant compounds. *The endosperm*, which constitutes the largest proportion of the kernel, is composed predominantly of starch. Removal of the bran and germ during refining reduces dietary fibre and eliminates part of the grain's micronutrient and phytochemical matrix [4,5]. The type of milling process determines the proportion of the whole grain kernel retained in the final

product, with differences in the retention of bran, germ, and endosperm influencing the nutrient composition of the flour [13].

Whole grains within Indian dietary recommendations

The 2024 ICMR-NIN Dietary Guidelines for Indians provide a reference allocation of approximately 250 g/day of cereals and millets for a healthy adult consuming a 2,000-kcal diet of which, 50% of cereals should be as whole grains or minimally polished grains, equivalent to approximately 125 g/day [6]. Including a diversity of whole grains in the diet can provide a broader range of dietary fibres, micronutrients and phytochemicals, as their composition varies by grain type. For example, consuming 3 chapatis a day (prepared using 90 g whole wheat flour), as a part of your balanced diet, shall provide you with 34% of your daily RDA (recommended Dietary Allowance) of Fibre while also providing vitamins like Vitamin B1, B3 and minerals like Iron, Magnesium & Zinc. Oats and barley provide - glucan which have proven benefits linked to cholesterol reduction. Therefore, dietary diversity across whole grains may support complementary metabolic benefits rather than relying on a single grain source.

Current Scenario on wholegrains consumption

Recent evidence suggests that whole grain consumption in India remains low, with average intake estimated at only ~42 g/day, compared with the 125 g/day recommended by ICMR-NIN. This represents only about 10% of total daily grain intake and may contribute to the growing burden of obesity, type 2 diabetes, and other non-communicable diseases. The shift from nutrient-dense whole grains and millets to more processed grain products has reduced dietary fibre and essential micronutrient intake [14]. As per Aashirvaad Happy Tummy platform findings, approx. 70% of Indians do not take adequate fibre indicating lack of wholegrains and other fibre rich food groups in diets [15].

Whole grains and glycaemic regulation

Whole grains may support glycaemic control through the combined effects of carbohydrate quantity and quality, including dietary fibre. Postprandial glycaemia is an important dimension of dietary carbohydrate quality and is characterised by both the magnitude and duration of the rise in blood glucose after consuming a carbohydrate-rich food.

Rapidly digested carbohydrates that produce large and sustained glycaemic excursions are considered to be of lower quality, as repeated exposure to such responses is associated with the development of type 2 diabetes and metabolic syndrome. In contrast, slowly digested carbohydrates generally produce a more gradual and attenuated glycaemic response over time.

Compared with refined grains, whole grains retain a greater proportion of indigestible carbohydrates, including resistant starch, arabinoxylans and β -glucan, which may reduce the rate of starch digestion and glucose absorption. Soluble, high-molecular-weight fibres such as β -glucan and water-extractable arabinoxylans increase gastrointestinal viscosity, potentially slowing gastric emptying, digestive-enzyme access and nutrient uptake, whereas fermentable fibres reaching the colon are metabolised by the gut microbiota to short-chain fatty acids primarily acetate, propionate and butyrate, which can be used locally or in peripheral tissues as metabolic substrates.

Overall, the physiological effect varies with grain species, starch characteristics, fibre type

and concentration, particle size, cooking, extrusion, fermentation and food formulation [7].

In a 2024 systematic review and dose-response meta-analysis, Ying et al. included 10 prospective cohort studies and 37 randomised controlled trials. In the cohort analysis, an intake of 50 g/day of whole grains was associated with lower risk of type 2 diabetes, with a relative risk of 0.761. Across the RCTs, whole-grain interventions reduced fasting blood glucose [8]. The prospective evidence supports an association between habitual whole-grain intake as part of balanced diet and lower diabetes risk.

Cardiovascular health and lipid metabolism

The cardiovascular effects of whole grains may be mediated through effects on fasting glucose concentration, systolic blood pressure, inflammation, LDL and total cholesterol. The best-established fibre-related effect is the cholesterol-lowering action of oat and barley β -glucan. Increased intestinal viscosity can reduce bile-acid reabsorption, increasing



faecal bile-acid excretion and hepatic conversion of cholesterol into new bile acids. Other whole grains may contribute through the displacement of refined carbohydrates and the delivery of phytochemical components, such as carotene and polyphenols.

A systematic review and dose-response meta-analysis by Hu et al. included 68 studies reported in 24 articles, with more than 1.6 million participants. Each 30 g/day increase in whole-grain intake was associated with reduced risk of coronary heart disease, cardiovascular disease and all-cause mortality.

The evidence indicates an association between higher whole-grain intake and a lower risk of metabolic syndrome; however, the observed relationship may also be influenced by residual confounding from other dietary and lifestyle factors [9].



et al. found that participants in the highest category of whole-grain intake had a 20% lower relative risk of metabolic syndrome than those in the lowest category (RR 0.80; 95% CI 0.67–0.97).

Satiety and feeling of fullness

Soluble fibres naturally present in whole grains, including β -glucan in oats and barley may enhance satiety by increasing the viscosity of gastrointestinal contents, slowing gastric emptying and moderating the rate of nutrient absorption. These effects can prolong post-meal fullness and reduce hunger or the desire to eat. Evidence from randomised controlled trials indicates that β -glucan has a favourable effect on satiety, although the response depends on the fibre dose, molecular properties and food matrix [10].

Metabolic syndrome as an integrated outcome

Metabolic syndrome comprises a cluster of interrelated cardiometabolic abnormalities, including central adiposity, elevated blood glucose and triglycerides, reduced HDL cholesterol, and raised blood pressure. In a 2021 meta-analysis of 14 observational studies, Guo

Conversely, the highest refined-grain intake was associated with higher relative risk of metabolic syndrome compared with the lowest intake. These findings suggest that the quality of grain consumption may be associated with the integrated metabolic-syndrome phenotype. The evidence indicates association between whole grains and reduced risk of metabolic syndrome and may be influenced by residual confounding from other dietary and lifestyle factors [11].

Translation into commonly consumed foods

Whole-grain ingredients can be incorporated into habitual diets through familiar staples and recipes. Whole-wheat atta provides a practical basis for everyday rotis, and other wheat-based preparations, while khapli or emmer atta offers an alternative traditional whole-wheat format with 30% more protein than regular flour.

Multigrain atta can be yet another way of incorporating meaningful portions of whole grains and broaden grain diversity and provide complementary fibre, micronutrient and phytochemical profiles. Other practical options include oats or millet porridge, value added flours like high protein atta, gluten free flour, barley or brown-rice khichdi, whole-grain upma, millet dosa etc. These foods should be positioned as components of an overall balanced diet and consumed alongside pulses or legumes, vegetables, fruits and dairy.

Conclusion

Whole grains may contribute to metabolic health through the combined effects of grain structure, diverse fibre fractions, micronutrients and phytochemicals. Evidence from prospective studies associates higher whole-grain consumption with lower risks of type 2 diabetes, cardiovascular disease and metabolic syndrome.

These benefits depend on the grain type, degree of processing, product formulation, serving size and the food replaced in the diet. The evidence primarily supports substituting refined grains with whole-grain or minimally polished alternatives.

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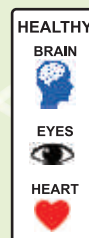
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Within the Indian dietary context, approximately 125 g/day of cereals and millets, to be consumed as whole or minimally polished grains. Whole-wheat atta, oats, barley, brown rice, maize and millets can be incorporated through familiar foods and recipes as part of a balanced and diverse diet.

This shall also be accompanied with continuous consumer awareness on importance of wholegrains and how to include them in their daily balanced diets. Overall, whole-grain inclusion represents evidence-supported component of a balanced dietary pattern for metabolic health.

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The Role of Speciality Oils and Fats in Healthier Food Reformulation

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Introduction

Food reformulation has become a primary focus within the global food industry, with manufacturers endeavoring to enhance nutritional content without compromising taste, texture, stability, or functionality. Growing regulatory pressures to eliminate industrial trans fats, reduce saturated fat intake, and promote sustainable food practices have driven innovation in speciality oils/fats. These tailored oil/fat systems offer the functional advantages of traditional

oil/fats while enabling producers to comply with current nutritional and labelling standards.

Recent advances in lipid engineering, oleogelation, structured lipids, and enzymatic interesterification have transformed speciality fats from ingredient substitutes into strategic tools for health-oriented food formulation.

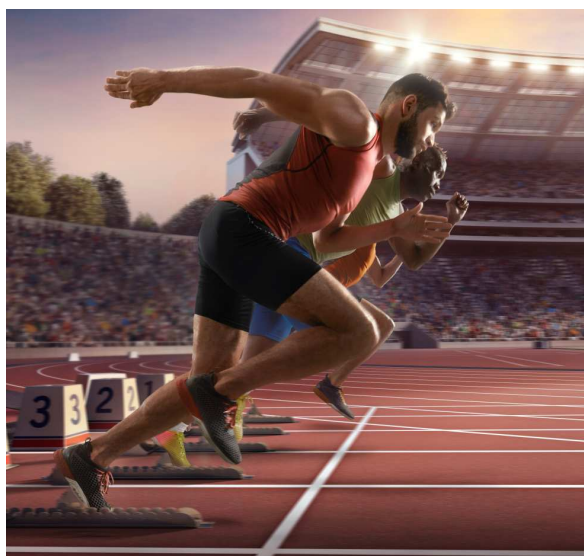
Speciality oils are crafted to deliver targeted nutritional and functional benefits while ensuring product quality. They

include high-oleic vegetable oils, speciality palm fractions, MCTs, structured lipids, omega-3 oils (like flaxseed and chia), and nutritional lipids like OPO. Speciality oils are key in reformulating products to cut trans and saturated fats and enhance fatty acid profiles. High-oleic sunflower, safflower, and canola oils offer stability and frying benefits with more healthy monounsaturated fats. They help reduce dependence on hydrogenated fats without sacrificing shelf life or performance.



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Speciality fats are custom lipid systems engineered for specific physical, sensory, nutritional, and processing properties. Unlike conventional fats, they are precisely formulated for

melting points, crystallization, textures, stability, and mouthfeel. These include CBEs, CBSs, interesterified fats, structured lipids, fractionated oils, oleogels, margarines, shortenings, and tailored blends for bakery, confectionery, dairy, and plant-based use. They enable manufacturers to optimize product performance and meet nutritional and regulatory standards. (1-5).

Process contaminants are another emerging focus in food reformulation, involving reducing and controlling process contaminants. Food manufacturers and ingredient suppliers are increasingly seeking speciality oils with minimised levels of contaminants such as 3-MCPD esters, glycidyl esters (GE), MOSH (Mineral Oil Saturated Hydrocarbons), and MOAH (Mineral Oil Aromatic Hydrocarbons).

Advances in refining technology, tighter control of raw material quality,

optimized deodorization conditions, and improved supply chain management have enabled the production of speciality oils that meet stringent global regulatory and customer requirements. As food safety standards continue to evolve, contaminant mitigation has become a key differentiator, helping manufacturers improve product quality, enhance consumer confidence, and ensure regulatory compliance while supporting clean-label and premium positioning strategies.

Why Speciality Oils/Fats Are Essential for Food Reformulation?

Replacement of Trans Fats: Partially hydrogenated oils were commonly used for their functionality in processed foods, offering plasticity, aeration, frying stability, and shelf life. However, scientific research linking industrial trans fats to cardiovascular disease has prompted regulations and initiatives like the WHO REPLACE program (1-3).

Manufacturers are replacing trans fats with specialized oil/fat technologies like interesterification, palm oil fractionation, high-oleic oils, structured emulsions, oleogels, and custom blends to maintain solid-fat functionality without creating trans fatty acids. (6-8)

MCT oils are increasingly used in clinical and sports nutrition and ketogenic formulations because they offer a quickly available energy source.

Structured lipids can also be designed to improve digestion, nutrient delivery, and metabolism for specific groups. A major innovation is adding long-chain polyunsaturated fatty acids (LCPUFAs) like DHA, EPA, and ARA. Traditionally from fish oil, these are now available via algal fermentation. DHA and EPA support heart, brain, and eye health, and ageing. As awareness rises, food makers fortify dairy, drinks, supplements, bakery, and functional foods with omega-3 oils.

In infant nutrition, speciality oils are crucial. Human milk's unique fat structure supports growth. Ingredients like OPO / SN2 palmitate mimic milk fat, enhancing fat and calcium absorption and aiding gastrointestinal comfort. Algal DHA and ARA support brain, vision, and immune development.



Reduction of Saturated Fat:

This phenomenon presents a technical challenge because solid fats are structurally important in foods. Replacing them with liquid oils often causes undesirable texture, reduced volume rise especially in laminated bakery products, lower oxidative stability, and shorter shelf life and also increased cost since all unsaturated oils happen to be significantly higher in cost than traditional palm oil which is the cheapest oil and has almost 50% saturates and 50% unsaturates. Also, as designers / reformulators we do need to consider the good quality saturates originating from mainly Coconut oil / palm kernel oil / desi ghee or anhydrous milk fat known to be rich in short or medium chain fatty acids and their beneficial effects. Speciality fats form organized lipid networks that mimic solid fats using healthier oils. Recent studies see structured oils and oleogels as promising ways to reduce saturated fats without losing quality. (1-3)

Applications of Speciality Oils/Fats in developing Healthier Food Products

Bakery Products: Fats help bakery products by lubricating dough, improving aeration, forming layers, enhancing tenderness,

retaining moisture, and improving mouthfeel. Today Vegetable oils / fats industry has made significant progress in producing trans free, lowered saturated specialized/ tailor-made vegetable shortenings / margarines through adoption of newer technological advances like interesterification, blending of saturated with unsaturated fats for manufacturing of cakes, cookies, pastries, and biscuits, which now help bakers achieve similar performance while improving nutrition. (6-8). Recent research shows oleogel-based systems can replace traditional shortenings in baked goods, maintaining taste and texture while reducing saturated fat. (1, 7)

Confectionery Products:

Chocolate and confectionery require fats with specific melting and crystallization traits. Speciality confectionery fats provide gloss, appearance, snap, texture, controlled melting, bloom resistance, and better processing. Cocoa butter equivalents and substitutes help manufacturers optimize functionality and cost-efficiency while maintaining quality and producing products which are available to masses at

affordable prices. Emerging structured lipid technologies like enzymatic interesterification to produce SUS fats aim to improve nutritional profiles, cost effectiveness and empowering manufacturers with better flexibility to bridge the demand and supply gap too without losing consumer acceptance. (4,8)

Plant-Based Foods: The rise of plant-based foods has driven increased demand for speciality fats, vital for enhancing sensory qualities in meat and dairy alternatives. These fats add juiciness to meat analogues, creaminess to dairy substitutes, authentic melting, better flavour release, and improved cooking. Research shows structured fats and oleogels enhance the realism and acceptance of plant-based products while supporting healthier fats options. (4,5,6)

Dairy Products and Frozen Desserts: Speciality fats in dairy and frozen desserts enhance creaminess, whipping, foam, freeze-thaw stability, and melting.

Structured lipid systems can improve nutritional quality while maintaining premium textures. However proper label declaration of ingredients used is of utmost importance to build customer trust, transparency and informed choice to consumers while buying (4,5)

Sustainability and Future Trends

Sustainability is increasingly vital in oils/fat reformulation. While tropical oils like palm oil remain common in speciality fats, environmental concerns are prompting alternative structuring methods. Research now focuses on sustainable sourcing, circular economies, valorizing by-products, plant-based lipids, precision engineering, low-saturated-fat formulas, and clean-label ingredients. The future of speciality oils/fats depends on technologies that balance nutrition, functionality, sustainability, and consumer acceptance. (5,6,8)

Challenges in Speciality Oil/Fat Reformulation

Despite progress, challenges remain- high ingredient costs, scale-up limits, stability issues, consumer acceptance, regulations, clean-label demands, and sourcing constraints.

Reformulation requires balancing technology, nutrition, cost, sustainability, and sensory qualities. (6-8)

Conclusion

Speciality oils/fats have become essential in contemporary food reformulation. By facilitating the substitution of trans fats, the reduction of saturated fats, the enhancement of nutritional profiles, and the development of plant-based alternatives, these specialized lipid systems play a crucial role in the future of food product innovation. Emerging technologies such as oleogelation, enzymatic interesterification, and structured lipids are further expanding food manufacturers' ability to develop healthier, more sustainable products without compromising consumer expectations. As regulatory pressures and consumer demands continue to evolve, speciality oils/fats will remain at the forefront of next-generation food reformulation strategies.

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Dietary Fiber And Gut Health

AUTHOR

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Dietary fibre is the non-starch carbohydrate in plant foods, such as whole grains, vegetables, fruit, and legumes, which have been dominant in human diets for centuries.

The Codex Alimentarius commission defines dietary fibre as edible carbohydrate polymers with three or more monomeric units that are resistant to the endogenous digestive enzymes and thus neither hydrolysed nor absorbed in the small intestine; and that belong to the following categories:
(1) edible carbohydrate polymers naturally occurring

in foods such as fruits, vegetables, legumes, and cereals;
(2) edible carbohydrate polymers obtained from food raw materials by physical, enzymatic, and chemical means that have a proven physiological benefit; and
(3) synthetic carbohydrate polymers with a proven physiological benefit. Discussions have been considering some non-carbohydrates such as lignin, polyphenols and other substances present in cell walls linked to polysaccharides as dietary fibres and the minimum

number of carbohydrate monomers to be included.
(1)

Types of Dietary Fiber
Dietary fibres are divided into insoluble and soluble forms. These are further subdivided either into polysaccharides (non-starch polysaccharides [NSPs], resistant starch [RS], and resistant oligosaccharides [ROs] and polyphenols including lignins. (fig 1).

Fig 1: Types of Dietary fiber (2)

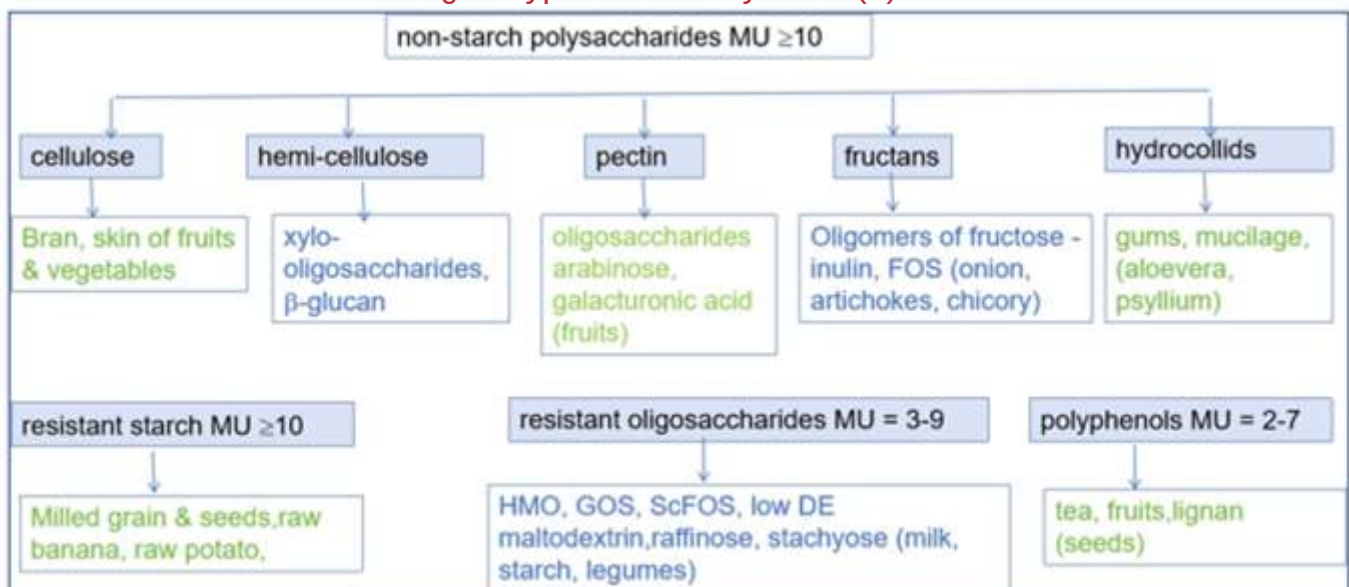




Fig 2: Major groups of bacteria in gut microbiome (3)

The NSPs mainly include cellulose, hemicellulose, pectins, inulin and various hydrocolloids with monomer units >10. Resistant oligosaccharides [ROs] have monomer units between 3-10, many of which were named after polymerized monosaccharides, such as galacto-oligosaccharides (GOS), xylo-oligosaccharides (XOS), and galactosides. Milled grains and seeds, raw potatoes, maize, green bananas contain resistant starch. Cooked and cooled carbohydrates such as rice, corn flour, etc contain resistant starch due to changes in starch structure called RS Type 3 or retrograded starch.(2)

Gut Microbiome

The human gastrointestinal tract contains a complicated ecosystem made up of trillions of microorganisms that are called the “gut microbiome”. (3).

The gut microbiome acts as a virtual organ system and is very important for keeping people healthy and

prevention from many gut related diseases.

The gut microbiome consists approximately of 100 trillion microorganisms and encodes over 3.3 million genes—exceeding the human genome by more than 150 times. It contains mainly six bacterial phyla: *Bacteroidetes*, *Firmicutes*, *Actinobacteria*, *Proteobacteria*, *Verrucomicrobia* and *Arachaea*; of these, *Bacteroidetes* and *Firmicutes* are predominant. (fig 2).

The gut microbiome starts to form and grow during birth and continues to do so throughout early life, with dietary patterns, environmental exposures, and host genetics all playing a role in its final composition. Dysbiosis, or the breakdown of this delicate ecosystem, has been linked to the development of many diseases, from metabolic disorders to neurological conditions. Change in

microbial flora is seen at various stages of life like infants, toddlers, adult and older groups. Firmicutes are more in number in children > 4 years.

Enterobacteriaceae are more common in elderly that results in low-grade inflammation due to lipopolysaccharides produced by the microbes. *Bifidobacterium*, responsible for decreasing pro-inflammatory markers, decreases in number with increasing age. Differences have been seen in gut flora of active and persons with sedentary lifestyle. *Firmicutes* are more abundant in persons with high fat consumption whereas *Bacteroides* are more in number in persons consuming more carbohydrates (3).

They are responsible for important metabolic functions like fermenting carbohydrates, making vitamins, and changing the immune system.

They also ferment dietary fibres and resistant starches, that can't be digested otherwise, and form short-chain fatty acids (SCFAs), mostly acetate, propionate, and butyrate. These metabolites provide energy for colonocytes, control the pH of the intestines, and have effects on metabolism and immune function throughout the body.

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and *E. coli* was observed indicating role of gut microbiome. In a study, the gut microbiome of Alzheimers disease affected patients

showed an increased abundance of proinflammatory bacteria such as *Escherichia/Shigella* and a decreased abundance of anti-inflammatory bacteria such as *Eubacterium rectale* compared to control.

At the phylum level, the microbiome of Alzheimers disease affected patients showed decreased *Firmicutes* and increased *Bacteroidetes*. (4)

Dietary fibre and gut microbiome

Dietary fibres escape digestion in the small intestine and are fermented by bacteria in the colon (gut). The degree of polymerization, particle size, solubility, viscosity, and other characteristics may influence fibre fermentability and the specific bacteria that can ferment the fibre. Fibers with a lower degree of polymerization (DP) can be degraded more rapidly in the gut into smaller molecules, resulting in faster fermentation. Thus, insoluble fibres with a higher degree of polymerization are generally less readily fermented by

gut microbiota than soluble dietary fibres. The dietary fibre that be easily fermented can serve as food for the gut microbiome (probiotics) are called prebiotics.

The probiotics can also ferment the prebiotics in a synergistic association. For example, inulin-type fructans were found to be extracellularly hydrolysed by *Bifidobacteria* in the human colon, liberating monosaccharides and/or oligosaccharides which is accessible to the secondary degraders such as *Anaerostipes hadrus* or *Faecalibacterium prausnitzii*, to produce butyrate. The utilization and metabolism of dietary fibre by probiotic bacteria results in generation of multiple metabolites, including gases (e.g., H₂, CH₄, CO₂), lactate, succinate, and short-chain fatty acids (SCFAs).

Major health benefits of SCFAs

The most abundant SCFAs are acetate, propionate, and butyrate. (fig 3). SCFAs play crucial regulatory roles in host metabolic homeostasis, immunological processes, maintenance of intestinal barriers, neurobiology, skeletal functions, and suppression of inflammation and carcinogenesis.

Other important functions of microbial flora are to make vitamins, especially B vitamins and vitamin K, which are important for the host's nutritional status. The microbial flora also helps in the absorption of dietary minerals such as magnesium, calcium, and iron, and is essential for bile acid metabolism via the enterohepatic circulation.

A study in Chennai showed that *Firmicutes* were 49% in both persons with and without type 2 diabetes, *Proteobacteria* were 32% in type 2 diabetic persons as compared to 26% in non-diabetic persons, *Bacteroides* were 17% in persons with type 2 diabetes as compared to 18% in non-diabetic persons, *Actinobacteria* were 7% in non-diabetic persons as compared to 2% in diabetic persons; rise in body mass index (BMI) in diabetics was associated with rise in number of gram negative bacteria. (3)

In persons with celiac disease decrease in *Bifidobacterium*, *Lactobacillus*, *Faecalibacterium prausnitzii* and an increase in *Bacteroides*, *Prevotella*

The organic acids lower colonic pH, enhancing mineral solubility and passive uptake. The reduction in intestinal pH can influence the

composition of the gut microbiota, creating an environment that favours beneficial microorganisms while limiting the growth of opportunistic pathogens.

Among the three most abundant types of SCFAs, Butyrate has been widely studied due to its anti-inflammatory and antioxidant effects. SCFAs, especially Butyrate, also play anti-inflammatory roles. Studies have reported that butyrate is capable of promoting a reduction in pro-inflammatory cytokines such as interleukin (IL)-8, IL-6, IL-12 and tumour necrosis factor (TNF)- α and an increase in the production of anti-inflammatory cytokines.

SCFA production can be promoted by increasing beneficial microorganisms through probiotics and providing substrates for their growth through prebiotics, which can provide health benefits to the host. (5).

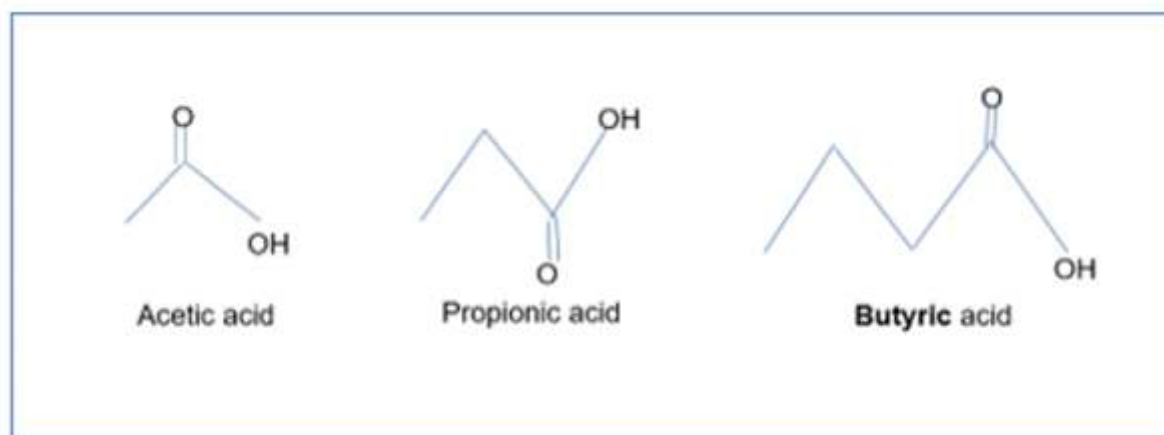


Fig 3: Chemical structures of major SCFAs (2)

Dietary fibre content of Indian Diets

The recommended allowance of dietary fibre is 25-40 g/day for an adult and should be taken in small amounts but at regular intervals. In habitual Indian diets, being based predominantly on unrefined cereals and plant foods, this level of dietary fibre intake is easily achieved in a

complete meal. The DF contents of selected Ready to Eat (RTE) Indian foods are shown in Table 1. (6).

The dietary fibre intake in plant-based diet is higher than animal-based diet. Table 2. (6). Among cereals, whole wheat or millet-based diets are generally higher in dietary fibre than in a rice-based diet.

Table 1: Dietary fiber content in major Indian ready to eat foods (6)

Product	*DF (g/100 g dry weight)		
	Soluble	Insoluble	Total
Pongal	2.11	6.12	8.23
Khara bhath	2.64	6.7	9.3
Dal fry	3.7	6.9	10.6
Bise bele bhath	3.36	9.97	13.33
Rajmah masala	6.46	12.4	18.86
Kesari bhath	6	8.8	14.8
Vegetable khichdi	12.3	5.9	18.2
Vegetable pulav	12.3	1.1	13.4
Chicken pulav	12.2	1	13.2
Mutton pulav	18.8	1.2	20
Sooji halwa	10.3	2.5	12.8
Upma	17.2	1.1	18.3
Potato peas curry	10.1	3	13.1
Cauliflower peas curry	5.1	0.4	5.5

* DF - Dietary fiber

Table 2: Dietary fiber in major food materials (6)

Food Item	g/portion	*DF (g/100 g dry weight)		
		Crude DF*	TDF ^	Soluble
Cereals and millets	30	0.564	3.411	0.552
Pulses	30	0.27	3.222	0.648
Egg	50	0	0	0
Meat/chicken/fish	50	0	0	0
Toned milk (ml) and milk products	100	0	0	0
Roots and tubers	100	0.73	2.86	0.93
Green leafy vegetables	100	0.8	3.25	0.8
Other vegetables	100	1.72	4.42	1.24
Fruits	100	0.625	1.95	0.65
Sugar	5	0	0	0
Fat and oils (visible)	5	0	0	0

*DF: Dietary fiber, TDF: Total dietary fiber



Summary

Growing evidence supports the beneficial effects of dietary fibre consumption on various aspects of human health. Recent research has provided a better understanding of the mechanisms involved, highlighting the important role of the gut microbiota in producing SCFAs and other functional metabolites that contribute to these health benefits.

Individuals who consume higher amounts of dietary fibre, compared with those with low fibre intake, may derive greater health benefits from the fermentation products of dietary fibre by gut

microbiome. Excessive consumption of dietary fibre may cause gastrointestinal discomfort, such as bloating and constipation. Therefore, when increasing fibre intake, it is advisable to increase water consumption as well.

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Zinc: Small Mineral, Significant Role

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Zinc, a micromineral required in milligram quantities, holds significant nutritional importance beyond its quantity. It is essential for immune function, growth, protein synthesis, and various cellular processes. Adequate zinc intake is not only determined by the zinc content in food but also by the body's ability to absorb and utilise it. Adult men need around 11 mg per day, while adult women require approximately 8 mg daily due to zinc's crucial role in numerous biological functions. Since the body has a limited capacity to store zinc, regular intake is vital for maintaining health. (1).

Zinc Functions Across the Life Cycle

Zinc is involved in cell growth and development, metabolism, cognitive performance, reproductive health, and supports immune health.

One of the critical roles of zinc is as a **structural component** of many proteins and enzymes, which are crucial for the metabolism and digestion of macronutrients. Zinc helps in the efficient conversion of food into energy.

In terms of **immune health**, zinc is involved in the production and regulation of immune system cells. It enhances the activity of various immune cells, thereby supporting the body's defense mechanisms against infections and diseases. This immune-boosting property is

particularly important during critical life stages, where the body may be more vulnerable to illness, such as childhood, adolescence, and pregnancy. During periods of **growth and development**, adequate zinc supports protein synthesis and cell division, which are fundamental to healthy growth in children and adolescents. For pregnant women, zinc helps in fetal development, influencing everything from cell division to the immune system development of the unborn child.

Zinc also contributes to **cognitive function**. It has been found to aid in



memory, learning processes, and overall cognitive performance. Its role in brain health is linked to its ability to influence neurotransmitter activity and neural communication (2).

Zinc is important for **reproductive health**. In men, it is vital for testosterone production and sperm development, while in women, it supports hormonal balance and proper ovulation. Overall, maintaining adequate levels of zinc can have profound effects on various aspects of health and well-being.

Food Sources:

Oysters and beef are the richest sources of zinc; however, their consumption is not widespread in India, leading to potential zinc deficiencies in the population. Other excellent sources of zinc include various meats, fish, seafood, eggs, and dairy products, all of which provide zinc in a highly bioavailable form. In animal-derived foods, zinc is primarily associated with proteins and other organic components of the food

matrix, and hence the higher bioavailability of zinc from animal foods is attributed to this and the absence of high phytate concentrations.

Plant-based sources such as beans, nuts, and whole grains do contain zinc, but the bioavailability from these foods is lower due to the presence of phytates. This is especially significant in vegetarian or vegan diets where reliance on plant sources for zinc is common.

Here, food fortification can be highly effective. Many products, including breakfast cereals, millet flour, and infant formulas, are often fortified with zinc to help increase its availability in the diet (3). But the nutritional value of a fortified food cannot be assessed only by the amount of zinc added. The food matrix, zinc compound, processing conditions and presence of inhibitors or enhancers can all influence zinc bioavailability.

Dietary Factors Influencing Zinc Absorption and Bioavailability:

Zinc absorption is influenced by the composition of the meal and the overall diet. One of the major dietary inhibitors is **phytate**. The phosphate group can form strong and insoluble complexes with

zinc that inhibit its absorption. Because staple foods in most parts of the world contain phytate, it is obvious that zinc status may be compromised in significant portions of the population. For example, soy-based infant formula compared with milk formula and human milk had very low zinc bioavailability due to the presence of phytate. When the phytate was removed from soy protein isolate by a precipitation process, zinc absorption was significantly improved (4). Thus, any reduction in dietary phytate content is likely to result in an improvement in zinc absorption.

There are several methods available to reduce the phytate content of various foods. Leavening of bread was shown early on to decrease its phytate concentration by 38% to 60% (5), and fermentation in general also achieves the same effect, resulting in enhanced zinc absorption. Germination and milling can also reduce the phytate content of legumes and cereals by 32% to 40% (6). Recently, the treatment of foods with food-grade commercial phytase has been shown to effectively reduce the phytate content of various foods, with a subsequent beneficial effect on mineral absorption. Calcium may also influence zinc bioavailability,

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of the inhibitory effects of phytate, while differences between individual protein sources may influence zinc absorption. Like, casein in milk has a detrimental

effect on zinc absorption, whereas whey protein is linked to improved zinc absorption compared to casein (6).

particularly in phytate-rich food matrices. Calcium can interact with phytate and zinc, potentially forming less soluble complexes.

Processing techniques not only improve shelf life, texture or convenience but also influence the nutritional quality and bioavailability of micronutrients.

Dietary protein also influences zinc utilisation. The relationship between dietary protein and zinc absorption is complex and may vary according to the quantity and type of protein as well as the overall composition of the meal. Several studies involving human participants have demonstrated that as protein content increases, fractional zinc absorption rises in a linear manner. In general, an increase in dietary protein results in both higher zinc intake and improved bioavailability.

The type of protein in a meal will also affect zinc bioavailability. Evidence suggests that certain animal proteins can mitigate some

Opportunities for Zinc Fortification Across Food Categories:

As the population is now demanding nutritionally enhanced foods, the food industry is trying its best to incorporate essential nutrients to meet consumers' demand and improve its products.

Likewise, zinc is also used in a variety of food categories. Shah, Dheeraj et al found out that the fortification of foods with zinc may improve the serum zinc status of populations if zinc is the only micronutrient used for fortification. If zinc is added to food in combination with other micronutrients, the difference in serum zinc status will not be very drastic (7).

Zinc may be incorporated into products designed to address specific nutritional requirements or to improve the micronutrient profile of commonly consumed foods.

A few such categories are:

1. Cereal and grain-based products

These are widely consumed, making them effective vehicles for zinc fortification. Products such as wheat-based foods, breakfast cereals, bakery products and other grain-based staples can be fortified. For instance, in the Indian market, oats and cornflakes fortified with zinc oxide/ zinc sulfate and other micronutrients are available, making them a balanced breakfast option. This can help address zinc deficiency in populations where dietary sources are limited. However, fortification strategies should consider how the cereal matrix and processing influence its absorption.

2. Dairy and dairy-alternative products

Dairy products naturally have zinc and can also serve as vehicles for micronutrient addition. Fortified milk-based beverages provide opportunities for zinc addition, particularly in products targeted towards children, adolescents or other vulnerable groups.



There are zinc-fortified RTD milkshakes, flavoured milk, and nutrition drink mixes available in the market.

3. Plant-based foods

The expansion of plant-based diets is attracting interest in zinc-fortified legumes, nuts, seeds, etc. If appropriate processing techniques are applied to reduce their phytate content, these products can be good carriers. For example, finger millet (ragi) flour has actually been investigated as a vehicle for zinc fortification. An Indian study found that adding zinc salts increased the bio-accessible zinc in fortified finger-millet flour by about 1.5–3 times, and combining zinc with EDTA further improved bio-accessibility (8).

4. Ready-to-cook foods

The CSIR-IHBT (Institute of Himalayan Bioresource Technology) has developed ready-to-cook products such as dalia, khichdi and

traditional beverage mixes using nutrient-dense ingredients including millets, pseudocereals and pulses, with enrichment in iron, zinc, calcium and vitamins. The technology specifically reports iron and zinc enrichment using *Spirulina platensis* (9).

Challenges during Fortification:

Fortifying foods with zinc involves several challenges, including selecting the right zinc compound based on solubility, bioavailability, and compatibility with the food matrix, since minerals can impact flavour, texture, and colour. Bioavailability is crucial, as high-phytate foods may hinder zinc absorption, so it should be considered from the start of product development. Additionally, fortificant stability during processing and storage is vital to maintain nutritional

effectiveness.

The choice of zinc fortificant is an important formulation consideration. Commonly used zinc compounds are listed in Table 1 with their common applications (10).

They differ in solubility, stability, cost, sensory characteristics, and bioavailability, so selection depends on the food matrix and processing conditions. Also, sensory acceptability is important, as consumers evaluate foods based on taste and appearance, requiring a balance between nutrition and consumer preferences.



Table 1: Commonly used zinc compounds

Compound	Characteristics	Applications
Zinc sulphate	High solubility and economical	Beverages, cereals, premixes, fortified foods
Zinc oxide	Commonly used, insoluble at neutral pH, and inexpensive	Cereals and flours, infant/child nutrition products
Zinc gluconate	Good solubility but costly	Beverages, supplements
Zinc citrate	Minimal changes in sensory properties	Fortified foods and beverages



standard unchelated inorganic options, other aspects such as regulatory approval, stability, and sensory quality must also be considered.

Conclusion

Zinc shows that micronutrient adequacy is not determined by nutrient content alone. The form in

which a nutrient is delivered, the composition of the food matrix and the processing methods used can all influence its nutritional value. As the demand for nutritionally enhanced foods grows, zinc fortification presents an opportunity to develop products that contribute to micronutrient intake.

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Beyond the choice of zinc salt, the interactions between zinc, phytate, calcium and other components of the food matrix can influence bioavailability. Chelating agents such as EDTA may improve zinc bio-accessibility in selected high-phytate matrices, but their effectiveness is formulation-dependent.

Therefore, the choice of fortificant and any absorption-enhancing strategy should be product-specific (11). In addition to cost factors, since Zinc EDTA is 5 to 10 times pricier per kilogram compared to



Seed Oils Demystified: Safe, Healthy, or Harmful?

AUTHOR

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Seed oils have been used in India and other Asian countries for centuries. Such oils as peanut, sesame, mustard, safflower and some other seed oils have been used in India for cooking and frying etc.

In the west, animal fats including butter have been the traditional fats. The fats are solid at ordinary temperature while oils are liquid. One of the important applications is baking, during which gas entrapped in the dough is held for a longer time because of the higher melting point, helping in leavening the dough and puffing the final product that is light and highly desirable. When

liquid corn oil is used the effect is not the same.

So, when the demand for fat increased, they produced margarine from vegetable oils by partial hydrogenation. It worked well in making product but there was a health issue because a large amount of trans fatty acids formed during hydrogenation that were found to be unhealthy.

This was one reason that probably made people to look at seed oils with suspicion, although it was partially hydrogenated oil that created problem. When full hydrogenation was carried out, there were no trans fats.

As Asian growers increased the production of oil seeds like soybean, cottonseed, sunflower seed, rice bran

and other oils like palm oil, the prices of vegetable oils dropped significantly and manufacturers started using them much more for applications as oils in frying etc. and even with improved total hydrogenation and interesterification that eliminated the problem of trans fat and also gave a fat of desirable higher melting point. Palm oil was winterised into palm stearin and palm olein, the former quite similar in physical characteristics to vanaspati or ghee.



This created questions about which of these fats and oils are healthier and scientists started comparing the safety and healthy nature of these. After the problem with trans fats, several perceptions were created to denigrate seed oils and show animal fats or some non-seed fruit oils like olive oil and avocado oil were better.

Are Seed Oils Unhealthy?

There were several unsupported comments passed against seed oils especially by influencers to denigrate them and to promote such oils as olive oil. While olive oil is good but very expensive so it becomes easier to make it desirable if other cheaper oils are shown to be unhealthy.

Firstly, seed oils are claimed

to cause inflammation. Seed oils contain very high levels of omega-6. These have not been shown to cause inflammation. On the other hand, omega-3 fatty acids are known to reduce inflammation. Just because seed oils contain low omega-3 does not make them inflammatory. There is no study showing conclusively the inflammation is caused by seed oils,

but the perception is created. Some seed oils such as canola, flaxseed, and soybean oils have good proportion of omega-3. The ratio of omega-6 to 3 is good in palm oil, but that is criticised because of high saturation (1).

Another criticism is due to most seed oils are refined. Earlier, we used to consume coconut, peanut, mustard or sesame oil from expellers without refining. Some people still miss that because of the typical smell of oil used to be very dominant. This smell unfortunately created problem for those not used to unrefined oils as some were very strong and anything cooked in them used to have that smell. Refined oils would get rid of volatiles that were responsible for their smell in addition to removing free

fatty acids that were responsible for faster rancidity and lower smoke point in frying. Some oils had colour that was not acceptable. So refining removed smell, colour, free fatty acids would provide an oil that would have no undesirable sensory properties and would be acceptable to all and for any application in food production. (2)

When expeller process is used for extracting oil, amount of oil remaining in expelled cake is substantial. When solvent is used the de-oiled cake has very little oil remaining so it is more economical. Commonly solvent used is hexane. After extraction, the oil is separated from solvent by evaporation that removes all the solvent except traces, that are removed during further refining. The cake is toasted to remove solvent. There is now physical refining process available that is now used especially for rice bran oil so the heart friendly resveratrol remains in the oil which was earlier removed by chemical refining. (3)

There is a newer process of oil extraction being developed, namely supercritical fluid extraction, in which highly pressured liquefied carbon dioxide is used to extract oil from crushed seeds.



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MRP ₹10 (incl. of all taxes) for 55g Instant Masala Noodles



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to link the seed oils with heart diseases, but it has been adequately shown that due to high level of unsaturated fatty acids in seed oils they are actually heart-friendly and reduce the cholesterol levels. On the other hand, animal fats have been implicated in elevating cholesterol and contributing to heart diseases.

The extracted oil and fluid can simply be brought to room temperature and pressure at which CO₂ again becomes gas and escapes leaving behind only the oil. This process at present is expensive but may in future become cost effective for edible oils. (4)

Some criticised seed oils because of high unsaturation that would cause faster rancidity and formation of trans fats at high processing temperature such as frying. Yes, high unsaturation can cause easier oxidation but when antioxidants are used this problem is overcome. Some antioxidants were said to be unsafe and were banned but the presently approved are safe.

Some new natural antioxidants like rosemary oil are also being tested for their use in oils. Studies also showed that frying and high temperature processing with seed oils produced negligible amounts of trans

fats. Even after ten frying in the same batch of oil would produce just 1% trans-fat. (5). Most commercial operations use continuous fryers that do not allow accumulation of oxidised or trans fats in the food products.

Blending oils is another way to utilise two or more attributes associated with oils, such as health-promoting components, frying stability, and resistance to fried food spoilage (rancidity). Rice bran oil contains oryzanol, and when blended with unsaturated oils such as sunflower and safflower, it brings out these benefits.

One can also blend sesame or mustard oil with a refined oil for gentle stir-frying or sautéing, or the Indian practice of “vagaar” or “tadka”.

Some influencers try

One of the favourite claims by many influencers and some health professionals, is that since seed oils are cheaper than other oils and fats, most commercial fried and otherwise processed food products use seed oils. Many studies have shown that the so-called ultra-processed foods are causing all kinds of lifestyle diseases such as overweight, obesity, type 2 diabetes, hypertension, high cholesterol, cardiovascular diseases among others. As these food products contain seed oils, their conclusion is that it is seed oils that cause all these problems. There is no proof as such but it is the guilt by association. (6)





In Conclusion

The seed oils are making edible oil at very cost-effective price and is quite safe for consumption. Decades of consumption has not shown any problems of safety with them.

Of course, proper checks are needed to maintain their safety and quality and most reputable companies are doing that with proper regulatory standards and procedures.

Over-consumption of oils through excess eating of fried and other high fat

foods, whether prepared in company or at home may certainly entail excess intake of calories with consequential overweight and other related problems would occur.

This would happen not just with seed oils but any other oil and fat.

So, it is advisable to maintain proper balanced diet with necessary nutrients including essential fatty acids from a variety of food products to ensure health of all. (7)

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Millets 2.0: Nutrition, Innovation & Sustainable Food Systems

AUTHORS



Ms Anuja Padte,
Food Scientist, PFNDAI

The Protein Foods & Nutrition Development Association of India (PFNDAI), in collaboration with Avinashilingam Institute for Home Science and Higher Education for Women and PSGR Krishnammal College for Women, Coimbatore, organised a NAA webinar on “**MILLETS 2.0: Nutrition, Innovation & Sustainable Food Systems**” on 21st August 2026.

The webinar brought together experts from the nutrition and food industry to discuss the importance of millets and whole grains in the context of nutrition, metabolic health, food innovation and sustainability. The programme also



Ms Samreen Shaikh,
Food Technologist, PFNDAI

incorporated a recipe contest titled “**Design India’s Next Millet-Based Superfood,**” encouraging students to explore applications of millets to create innovative food products. Ms Samreen Shaikh introduced the speakers and experts and provided an overview of the sessions that followed, setting the context for the discussions.

The webinar commenced with a welcome address by **Ms Dolly Soni, Marketing and Projects Manager, PFNDAI.** Ms Soni welcomed speakers and participants and also introduced the theme of the programme. The webinar



focused on bringing together the traditional nutritional value of millets with modern nutrition science, food innovation and sustainability.

The theme address on “**Dietary Fibre and Gut Health**” was given by **Dr Malathy**



Venkatesan, Project Coordinator, PFNDAI. Dr Malathy highlighted the importance of dietary fibre, its different types and its role in maintaining a healthy gut microbiome. She discussed sources of non-starch polysaccharides, resistant starch, resistant oligosaccharides and polyphenols, along with their presence in whole grains, millets, fruits, vegetables, legumes and other plant foods.

She explained how gut microbiota ferment dietary fibre to produce short-chain fatty acids (SCFAs), such as acetate, butyrate and propionate, supporting beneficial microbial populations and contributing to gut health.

She covered the role of dietary fibre in reducing pathogenic microbes, improving mineral absorption and supporting overall health. Possible effects of excessive fibre intake and the importance of adequate water consumption while increasing dietary fibre were also discussed.

Dr Kejal Joshi, Nutrition Manager, Marico India Limited, delivered a presentation



on “From Ancient Grain to Modern Nutrition: The Rise of Millets.” She talked about the nutritional, functional and sustainability potential of millets and their transition from traditional staples to modern food ingredients. Dr Kejal discussed the nutritional benefits of millets, their bioactive components, anti-nutritional factors and the role of processing techniques such as soaking, germination, fermentation, de-branning, extrusion and roasting in improving their utilisation.

The presentation covered emerging applications of millets in breakfast cereals, snacks, beverages, plant-based foods and specialised nutrition products, while also addressing challenges related to taste, texture,

processing, shelf life, consumer awareness and supply-chain standardisation.

Ms Nupur Agarrwal, Manager – Nutrition Science, ITC Limited next presented on

“Whole Grains for Metabolic Health.” She discussed the growing concern around metabolic health in India and highlighted the importance of balanced diets, dietary diversity and healthier staple food choices. She explained the role of whole grains such as whole wheat, oats, millets, barley, maize, quinoa, and amaranth in supporting metabolic health, particularly in relation to diabetes, cardiovascular health, weight management and metabolic syndrome.



She examined whole wheat flour, multigrain atta and high-protein atta as practical approaches to incorporating fibre and other nutrients into diets. The use of grains and legumes such as soy and chickpea to improve the protein quality of staple foods was also mentioned. She emphasised that greater consumption of whole grains, with healthier food choices, can improve nutritional quality and metabolic health.

A recipe contest titled “Design India’s Next Millet-Based Superfood” was organised by PFNDAI in collaboration with Avinashilingam Institute for Home Science & Higher Education for Women and PSGR Krishnammal College for Women and was sponsored by ITC Limited and Marico India Limited. Students from Coimbatore colleges participated in the contest. The contest encouraged students to develop innovative millet-based food products and demonstrate how millets can be incorporated into recipes using ITC’s Aashirvaad Millet Atta and Sattu Maavu. The judging panel

comprised **Ms Vandana Rajiv,** Executive – Nutrition Sciences, ITC Limited and **Dr Kejal Joshi.** The

winning entries reflected creativity, product innovation and the versatility of millet-based ingredients. The winners were announced by **Ms Dolly Soni.**





First Prize: Jasmitha J & Prethika K
PSGR Krishnammal College for Women
Product: Rose Millet Ravioli & Millet Apple Harmony

Second Prize: S Sayaa Sri & Rinsha J
PSGR Krishnammal College for Women
Product: Sathu Kaleji

Third Prize: Divya Sree S & Joseph Jaiswi A
Dr. N.G.P Arts and Science College
Product: Aashirvad Quadri Multinutri Wrap



The winners' announcement was followed by a Nutrition Week Message delivered by Dr K. Devi, Assistant Professor, Department of Food Science and Nutrition, Avinashilingam Institute,



and Dr N. Deepa Sathish, Head, Department of Food Processing Technology and Management, PSGR Krishnammal College.

The message complemented the overall theme of the webinar by reinforcing the



importance of nutrition awareness and encouraging students and the wider community to make informed food choices. The programme concluded with a vote of thanks delivered by Ms Samreen Shaikh.



Report on School Nutrition Awareness Activity, TMC School, Thane

AUTHOR

Ms. Sanyukta Telange,
Food Technologist &
Regulatory Support, PFNDAI



Protein Foods & Nutrition Development Association of India, in collaboration with JRS Rettenmaier India Pvt. Ltd., successfully conducted a School Nutrition Awareness Activity on 7th August 2026 at TMC School No. 23 & 102, Thane West. The programme included interactive sessions by experts from JRS Rettenmaier India Pvt. Ltd., followed by a poster competition for the students.

The event began with Ms Dolly Soni, Marketing & Projects Manager, PFNDAI, introducing PFNDAI and the Nutrition Awareness Activity.

She introduced the experts from JRS Rettenmaier India Pvt. Ltd., who delivered informative and engaging talks on food, nutrition, and healthy lifestyle habits.

Ms Prajakta Surve, Manager - Technical Sales, JRS Rettenmaier India Pvt. Ltd., spoke to the students about the importance of regular physical activity and good nutrition. She explained that the body requires a balanced diet comprising macronutrients such as carbohydrates, proteins and fats, along with essential micronutrients. To make the session engaging, she asked



students to identify different food sources of these nutrients, to which they responded enthusiastically. She also highlighted the importance of adequate Vitamin D and regular body movement for maintaining good health.

Mr Saleel Yardi, Assistant Manager - Sales, JRS Rettenmaier India Pvt. Ltd., explained the importance of nutritious food, emphasising that the human body needs the right nutrition to function properly. He briefly explained the role of





macronutrients and micronutrients and encouraged the students to include a variety of colours on their plate by choosing different fruits and vegetables. He engaged the students through multiple-choice questions on food and nutrition. The students actively participated and learnt several interesting facts about the human body and healthy eating. He also emphasised the importance of adequate hydration and

regular exercise.

Following the talks, a poster competition was organised for the students. Paper and crayons were provided, and the students were asked

to create posters highlighting good food choices, healthy eating habits, and foods that should form part of a healthy diet. Three divisions of Std. 8 participated in the activity, with three winners selected from each division. The winners were announced at the end of the event.

The activity concluded on a positive note, with the students being provided

bananas as a nutritious snack. As a token of appreciation and encouragement, Ms Pranali and Mr Saleel also distributed exam pads and pens to the participating students.

The activity helped students learn about nutrition and healthy lifestyle habits. PFNDAI sincerely appreciates JRS Rettenmaier India Pvt. Ltd. for sponsoring the activity and extending their support and expresses its gratitude to Mr Saleel Yardi and Ms Prajakta Surve for their valuable contribution towards promoting awareness about food, nutrition, and healthy living among school students.







REGULATORY ROUND UP



AUTHOR

Ms. Sanyukta Telange,
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•Declaration of Non-Food Grade item in the Bill of Entry in ICEGATE/SWIFT: 10-08-2026

FSSAI has issued a public notice advising importers and customs brokers to declare the qualifier “NFG” (Non-Food Grade) in ICEGATE for items that are imported for non-food use, particularly products having both food and non-food applications under the same HSN code. This will help ensure correct PGA routing through the SWIFT system and prevent non-food items from being unnecessarily referred to FSSAI for clearance.

<https://fssai.gov.in/docs/food-law/advisory/FSSAI-NFG-Public%20Notice%20-%2010-08-2026.pdf>

•Final Food Safety and Standards (Packaging) Amendment

Regulations, 2026 regarding the inclusion of

the list of packaging materials for Pan Masala: 10-08-2026

FSSAI has amended the Food Safety and Standards (Packaging) Regulations, 2018 to specify the permitted packaging materials for Pan Masala. The amendment allows packaging made of paper, paperboard, cellulose, or other naturally derived materials, provided they are free from plastic (including but not limited to Polyethylene, Polypropylene, Polyester, polyvinyl chloride (PVC), or any synthetic polymers, copolymers, or laminates and also free from Aluminium foil or metallised layers. Tin and glass containers are also permitted. The amendment also makes certain

provisions of the Plastic Waste Management Rules, 2016 applicable to such packaging.

[https://fssai.gov.in/docs/food-law/notice-comment/Final%20Food%20Safety%20and%20Standards%20\(Packaging\)%20Amendment%20Regulations,%202026.pdf](https://fssai.gov.in/docs/food-law/notice-comment/Final%20Food%20Safety%20and%20Standards%20(Packaging)%20Amendment%20Regulations,%202026.pdf)

•Draft regulation: Food Safety and Standards (Safe Food and Balanced Diets for Children in School) Amendment Regulations, 2026: 11-08-2026

The draft regulation "Food Safety and Standards (Safe Food and Balanced Diets for Children in School) Regulations, 2020" was released on August 11, 2026. This draft outlines the thresholds for fat, sugar, and salt content, classifying them as high based on the Dietary Guidelines for Indians 2024, by the Indian Council of Medical Research (ICMR).



•Reconstitution of Scientific Committee Panels: 01-09-2026

FSSAI has reconstituted its Scientific Committee under Section 14 of the Food Safety and Standards Act, 2006,

comprising six independent scientific experts.

The Committee will provide scientific opinions and advice to the Food Authority on matters relating to food safety and standards. Its term will be three years or until further orders, whichever is earlier.

The order also notes that FSSAI has reconstituted 21 Scientific Panels.

<https://fssai.gov.in/docs/food-law/advisory/Scientific%20Committee%20Order.pdf>

•Gazette Notification of NABL Accredited Laboratories under Section 43(1) of FSS Act: 03-09-2026

This order provides the

latest list of FSSAI-approved laboratories with the validity of their accreditation as on 25.08.2026.

<https://fssai.gov.in/docs/food-law/notice-comment/Notification%20dt%2025.08.2026.pdf>



•Validity Order of FSSAI-notified Food Testing Laboratories as on 7th September 2026: 09-09-2026

FSSAI has issued an updated list of FSSAI-recognised food testing laboratories, along with the validity of their NABL accreditation as of 7 September 2026.

<https://fssai.gov.in/docs/food-law/advisory/Validity%20order%20September%20final.pdf>

- **High Fat:** Food containing more than 4.2g/100g of added fat in solid or more than 1.5g /100 ml in liquid form is considered 'high'.
- **High Sugar:** Food containing more than 3g/100g of added sugar in solid or more than 2 g/100 ml in liquid form is considered 'high'.
- **High Salt:** Food containing more than 0.625g/100g of salt in solid or more than 0.175 g/100 ml in liquid form is considered 'high'.
[https://fssai.gov.in/docs/food-law/notice-comment/Draft%20Food%20Safety%20and%20Standards%20\(Safe%20food%20and%20balanced%20diets%20for%20children%20in%20school\)%20Regulations,%202026.pdf](https://fssai.gov.in/docs/food-law/notice-comment/Draft%20Food%20Safety%20and%20Standards%20(Safe%20food%20and%20balanced%20diets%20for%20children%20in%20school)%20Regulations,%202026.pdf)



Clinical Trial Backs Astaxanthin for Fat Burning in Active Women

A recent clinical trial has provided compelling evidence that astaxanthin enhances fat burning during moderate exercise in recreationally active women.

The study, published in the *Journal of Dietary Supplements*, involved 20 participants who supplemented with 12 mg of astaxanthin daily for two weeks in a randomized, double-blind, placebo-controlled crossover design. Researchers measured energy-use efficiency through cycling sessions at varying intensities, using respiratory exchange ratio (RER) as the biomarker to determine the balance between fat and carbohydrate utilization. Results showed a statistically significant increase in fat oxidation compared to placebo, with overall RER

values lower after astaxanthin supplementation. Importantly, these metabolic improvements occurred without increases in heart rate, blood lactate, or perceived exertion, indicating enhanced energy efficiency without added strain.

The findings are notable because women are historically underrepresented in sports nutrition research, and this trial offers rare clinical data demonstrating meaningful metabolic benefits in female athletes. Study author Hunter Waldman, Ph.D., emphasized that the results highlight a shift in sports nutrition from maximizing output to improving metabolic efficiency,

positioning astaxanthin as a nutrient that optimizes cellular energy production rather than simply pushing the body harder. Astaxanthin is among the few nutrients with measurable metabolic impact in women, supporting steadier energy levels and more efficient performance by promoting fat utilization during exercise.

This trial builds on extensive research portfolio, which includes over 85 human clinical studies documenting astaxanthin's role in supporting cellular energy, resilience, and recovery.

<https://www.nutritioninsight.com/news/astareal-astaxanthin-fat-burning-active-women.html>

processed or minimally processed. They found that high-quality plant-based diets were consistently linked to lower risks of heart disease, type 2 diabetes, and mortality, while unhealthy diets were associated with higher risks. Crucially, these associations remained nearly identical regardless of whether the foods consumed were ultra-processed or minimally processed, suggesting that processing alone is not a reliable indicator of healthfulness.

The study used the Nova classification system to assess processing levels but emphasized that this

framework does not account for nutritional value. Researchers noted that some ultra-processed foods can be beneficial, while certain minimally processed foods may be detrimental. Co-author Xiaowen Wang, Ph.D., explained that processing itself is not inherently harmful and advised focusing on overall diet quality, emphasizing nutrient-dense foods such as whole grains, fruits, vegetables, nuts, legumes, and healthy plant oils. Independent experts welcomed the findings, describing them as an important counterbalance to widespread assumptions that all ultra-processed foods are harmful.

Diet Quality Outweighs Food Processing for Disease Risk, Harvard Study

A large-scale Harvard study has highlighted that the nutritional quality of plant-based diets is more important for long-term health outcomes than the level of food processing.

Drawing on data from over 200,000 US adults tracked across three cohorts since the 1980s, researchers categorized diets into four groups: healthy or unhealthy, and ultra-



They stressed that equating products like fortified cereals with sugary sodas simply because both are processed is misleading, and this study provides empirical evidence to correct that misconception.

While the abstract does not yet include full details, including data on animal-derived foods,

the results challenge previous research that has linked ultra-processed food consumption to various health risks. Experts caution that food structure, formulation, and sensory characteristics remain intertwined with health outcomes, but they agree that prioritizing diet quality over processing level is a more

accurate and practical approach. The findings may also help reduce consumer anxiety about processed plant-based alternatives, supporting more sustainable dietary shifts.

<https://www.nutritioninsight.com/news/diet-quality-ultra-processed-foods-disease-risk.html>

Morinaga Milk Study Links Bifidobacteria to Lower Inflammatory Responses

Morinaga Milk has released new findings showing that bifidobacteria may play a role in regulating inflammatory responses, with implications for healthy aging.

Published in iScience, the study analysed blood samples from 50 healthy adults, generating monocyte-derived dendritic cells (moDCs) to evaluate their inflammatory responsiveness. Researchers found that participants with higher gut bifidobacteria levels had moDCs that produced lower amounts of inflammation-related substances such as IL-6 and IL-8

when exposed to bacterial stimuli. This suggests that bifidobacteria abundance is linked to reduced inflammatory activity in immune cells.

The study also included cell-based experiments where moDCs were exposed to bifidobacteria-derived components. These cells showed a lower production of inflammatory substances compared to controls, reinforcing the idea that bifidobacteria can directly influence immune cell behaviour. Morinaga Milk highlighted that chronic low-grade inflammation is associated with aging and age-related diseases, and these findings suggest bifidobacteria may help maintain balanced immune responses, potentially supporting healthier aging.

Beyond gut health, bifidobacteria are increasingly recognized for their systemic benefits. Morinaga Milk has previously reported that its strain B. longum BB536, combined with healthier diets and exercise, slowed biological aging in overweight men by an estimated 2.2% over three months. The company emphasizes that aging is influenced by chronic inflammation and sees these results as a foundation for developing future products aimed at modulating inflammatory responses. It plans to continue investigating how bifidobacteria affect immune regulation and pursue applications that support long-term human health.

<https://www.nutritioninsight.com/news/morinaga-bifidobacteria-inflammatory-response-study.html>

Global Experts Launch Policy Roadmap to Improve Children's Health and Diets in India

The Let's Fix Our Food (LFOF) Consortium has unveiled a 10-policy roadmap aimed at improving children's and adolescents' diets in India, responding to rising rates of overweight, obesity, and early indicators of chronic disease.

Coordinated by the Indian Council of Medical Research-National Institute of Nutrition (ICMR-NIN), the initiative brings together national and international partners including NITI Aayog, UNICEF, WHO, the Public Health Foundation of India, and Deakin University. The roadmap emphasizes healthier school food environments, stronger nutrition literacy, regulation of marketing for foods high in fat,

sugar, and salt (HFSS), and front-of-pack nutrition labelling.

The policies are designed to work as a comprehensive suite of regulatory, fiscal, educational, and behavioural measures. They highlight urgent concerns: in 2025, approximately 41 million Indian children aged five to 19 were overweight or obese, while the Comprehensive National Nutrition Survey (2016-18)

revealed that 10% of adolescents were pre-diabetic, 1% diabetic, and 5% had elevated blood pressure. Experts stress that malnutrition in India now includes both undernutrition and obesity, with unhealthy diets driving poor health outcomes. School food environments are singled out as problematic, with HFSS foods widely available in canteens and from nearby vendors.

Two major gaps are identified:

the lack of a legal definition for HFSS foods, which complicates marketing restrictions, and inconsistent regulation of school canteens. The consortium also points to the rise in ultra-processed food consumption among children post-COVID, underscoring the need for improved nutrition literacy and stronger enforcement of food environment regulations. UNICEF's Marie-Claude Desilets emphasized that every child

has the right to grow up in a food environment that supports healthy growth, learning, and potential. The roadmap, supported by nearly three years of research and stakeholder consultation, is positioned as a critical step toward evidence-based, multisectoral action to safeguard the health of India's younger generations.

<https://www.nutritioninsight.com/news/lets-fix-our-food-india-children-diets.html>

American Nutrition Association Backs Finger-Prick GKI Test to Track Metabolic Health

The American Nutrition Association (ANA) is advocating for the broader use of the glucose ketone index (GKI), a simple finger-prick blood test designed to provide real-time insights into metabolic health.

The test calculates the ratio of blood glucose to ketones, offering a window into whether the body is primarily using glucose or ketones for energy. A lower GKI is associated with improved mitochondrial function and potentially reduced risk of chronic diseases such as cancer, cardiovascular disease, type 2 diabetes, obesity, and neurodegeneration. Originally developed to monitor cancer patients' adherence to therapeutic diets, the GKI is now being positioned as a tool for personalized nutrition care, helping practitioners quickly assess whether dietary interventions are effective without months of trial and error.

Corinne Bush, CEO of ANA and co-author of a recent paper on the subject, emphasizes that the test could enhance patient compliance by shortening the feedback loop between intervention and measurable outcomes. She highlights that the best candidates are motivated patients for whom nutritional ketosis is an appropriate therapeutic strategy, particularly those managing conditions like type 2 diabetes.

However, she also stresses that the utility of the test depends on professional interpretation, warning that biomarker values alone, without expert guidance, may lead to adverse outcomes.

The ANA underscores systemic barriers to adoption, including the lack of nutrition education in medical schools and limited insurance reimbursement for personalized nutrition services. Despite certified nutrition specialists being trained to interpret biomarkers like GKI, they are often not licensed to practice at the level of their expertise, and their services are rarely covered by insurers. The organization calls this a

policy gap rather than a knowledge gap, urging reforms to make biomarker-driven nutrition care more accessible.

The broader promise of GKI lies in its ability to help practitioners tailor carbohydrate restriction and ketosis levels to individual patients, potentially improving metabolic balance and reducing disease risk. While universal GKI targets have not yet been validated, the test is seen as a low-cost, accessible tool that could redefine convenience in therapeutic nutrition.

Future research is expected to standardize reporting of glucose, ketone, and GKI values, alongside other biomarkers such as triglycerides and inflammatory markers, to strengthen its clinical utility. Bush anticipates that consumer platforms will increasingly integrate real-time biomarkers like GKI, but insists that genuine access to certified nutrition specialists must accompany these tools to ensure safe and effective outcomes.

<https://www.nutritioninsight.com/news/ana-finger-prick-glucose-ketone-metabolic-health.html>

SOFI 2026: Global Hunger Eases but Healthy Diet Costs Stall Women's and Children's Nutrition

The 2026 State of Food Security and Nutrition in the World (SOFI) report shows that global hunger has eased slightly, but progress remains fragile and uneven.

Between 608 and 696 million people faced hunger last year, a modest decrease from 2025, leaving 645 million still affected. Africa has now overtaken other regions as the most severely impacted, with 309 million people experiencing hunger. While Asia and Latin America have made steady progress, Africa's upward trend has only just halted, and the affordability of healthy diets remains a major barrier. In 2025, 66.6% of Africa's population could not afford a healthy diet, highlighting the affordability crisis at the heart of food insecurity.

The report underscores that one in three people globally

cannot afford a healthy diet, with costs rising from 3.44 PPP (Purchasing Power Parity) dollars in 2021 to 4.28 PPP dollars in 2025. Families often resort to monotonous meals of maize porridge or plain rice, leading to chronic stunting and wasting in children under five. Women's nutrition is also lagging, with anemia rates widening across regions, while obesity continues to rise, climbing from 12.1% in 2012 to 16.2% in 2024. Childhood obesity has sharply increased in Oceania, further complicating global nutrition targets.

Action Against Hunger warns that aid cuts have severely undermined emergency nutrition efforts, forcing the organization to reduce staffing by over 60% and scale back more than 40% of its nutrition sites. More than 100 health facilities have closed or reduced services, leaving mothers to travel long distances for help. The situation is worsened by overlapping crises such as conflict, inflation, climate shocks, and outbreaks like Ebola, which strain already fragile health systems.

Despite these challenges, the report notes that food insecurity affected 25.8% of the global population in 2025, down from 28.7% in 2020, with 86 million fewer people experiencing food insecurity compared to 2024. Hunger affected 7.8% of the global population in 2025, down from 8.1% in 2024. However, the trajectory toward ending hunger by 2030 remains off track. Action Against Hunger stresses that malnutrition is predictable and treatable, but requires political will, sustainable funding, and decentralized supply chains. The private sector is seen as an important partner, bringing capital, technology, and expertise to strengthen food systems, while also engaging employees and consumers in addressing malnutrition. The report concludes that hunger is not simply about food availability but about affordability and priorities, calling for systemic change to ensure equitable access to healthy diets worldwide.

<https://www.nutritioninsight.com/news/sofi-2026-hunger-nutrition-food-security.html>

AHA Identifies Safe Caffeine Threshold, Flags Above-Limit Cardiovascular Risks

The American Heart Association (AHA) has released a scientific statement clarifying caffeine's cardiovascular safety profile.

It concludes that up to 400 mg of caffeine per day — roughly equivalent to five cups of unsweetened coffee — is generally safe for most adults and may even lower the risk of conditions such as

stroke, heart failure, and heart disease. Coffee consumption at this level has been linked to reduced risk of type 2 diabetes and atrial fibrillation, though the benefits diminish when sugar, cream, or flavourings are added.

Beyond the 400 mg threshold, however, caffeine intake is associated with adverse cardiovascular effects, including elevated blood pressure and irregular heart rhythms. Energy drinks and

shots are singled out as particularly risky, often containing three to four times more caffeine than coffee. The statement notes that caffeine metabolism varies depending on genetics, age, medications, and tolerance, meaning individual responses can differ widely.

Short-term effects of caffeine include increased heart rate, blood pressure, blood sugar, and alertness, alongside potential sleep disruption and palpitations.

The review also highlights cafestol, a compound found in unfiltered coffee types such as espresso, French Press, Turkish, or boiled coffee, which can raise LDL cholesterol levels.

Most of the evidence reviewed relates to coffee rather than caffeine in isolation, raising questions about whether observed benefits stem from caffeine itself or other compounds in coffee. Coffee's

antioxidant and anti-inflammatory properties, as well as its influence on the gut microbiome, may contribute to improved cardiovascular and cognitive outcomes. Other caffeine sources — tea, dark chocolate, soda, medications, and energy drinks — remain less studied, underscoring the need for more clinical trials across diverse products.

The AHA emphasizes that

caffeine is one of the most widely consumed substances globally, but safe consumption is not universal. What is tolerable for one person may trigger anxiety, palpitations, or sleep problems in another, reinforcing the importance of individualized approaches to caffeine intake.

<https://www.nutritioninsight.com/news/aha-caffeine-threshold-heart-health-review.html>

Plant-Based Whole Food Proteins Blunt Post-Workout Muscle Synthesis, Study Finds

The study published in the *American Journal of Clinical Nutrition* examined how plant-based whole food proteins compare to animal proteins in stimulating muscle synthesis after resistance exercise.

Researchers found that both a rice-and-beans meal and a nutrient-matched plant protein shake produced similar muscle-building responses, but both were significantly less effective than consuming 20 g of lean pork.

The trial involved 11 healthy young adults performing leg exercises, followed by either the rice-and-beans meal or the shake, each containing 20 g of protein and over 100 g of carbohydrates. Blood samples

and muscle biopsies revealed that the carbohydrate load slowed gastric emptying, delaying amino acid availability in the bloodstream. This limited muscle protein synthesis despite the protein content. The shake produced only a brief spike in amino acids, while the whole-food meal prolonged release but still failed to match the anabolic response of animal protein.

The findings suggest that the fibre matrix and carbohydrate density in plant-based whole foods blunt the immediate post-exercise muscle-building effect. While complementary protein pairing improves quality, achieving 20 g of protein from whole plants requires high carbohydrate intake, which hinders rapid amino acid delivery. In contrast, animal proteins provide more efficient amino acid availability with lower energy intake.

Study co-author Nicholas Burd emphasized that muscle protein synthesis depends on timely amino acid delivery rather than product labels. He recommended that post-workout formulations balance 20–30 g of protein with 30–60 g of carbohydrates, tailored to exercise intensity. For vegan athletes, optimized plant-based isolates or hybrid blends with free-form amino acids may better trigger muscle synthesis during the critical recovery window.

Overall, the research highlights trade-offs between nutrient density and anabolic efficiency, suggesting that while whole foods support long-term recovery and health, immediate post-exercise muscle repair may require more targeted protein formulations.

<https://www.nutritioninsight.com/news/plant-based-protein-muscle-synthesis-carbohydrates.html>



FOOD SCIENCE & INDUSTRY NEWS

Nutrition Experts Urge Scientific Validation Of AI-Generated Ingredient Innovations

The artificial intelligence is reshaping ingredient innovation in nutrition, while emphasizing that speed alone is not enough — scientific validation remains the decisive factor.

Industry leaders from Brightseed and Nuritas highlight that AI can compress discovery timelines and generate novel bioactive candidates, but the credibility of these innovations depends on rigorous clinical trials, peer-reviewed publications, and reproducible results. They caution against

“black-box” decision-making, stressing the need for explainability, transparency, and clear distinctions between AI-predicted outcomes and clinically proven claims.

Data quality emerges as a central challenge. Sparse, proprietary, or incorrect datasets weaken predictive models, and experts warn that poor-quality inputs can produce outputs that appear sophisticated but lack scientific actionability. Human oversight is therefore essential, with multidisciplinary teams — including scientists, clinicians, and regulatory professionals — needed to interpret AI outputs and avoid confirmation bias. AI should serve as a hypothesis-generation tool, not a substitute for proof, and

ingredient candidates must undergo the same rigorous validation as traditionally discovered ones.

Marketing and communication also play a critical role. Successful ingredient launches require making the science accessible across different stakeholders, from formulators concerned with stability and performance to commercial teams focused on consumer needs. Experts argue that companies must separate product-level scientific claims from brand-level messaging, ensuring that evidence leads the narrative while trust and credibility carry the emotional connection. Ultimately, the consensus is that AI can elevate nutrition innovation by helping scientists ask better questions and identify stronger candidates, but only if paired with robust validation, transparent communication, and high-quality data.

<https://www.nutritioninsight.com/news/ai-nutrition-challenges-data-brightseed-nuritas.html>

Reformulation Beyond Sugar Reduction for Metabolic Health

Food reformulation is evolving beyond simple sugar reduction to encompass broader strategies for supporting metabolic health.

The soluble fibre is a versatile ingredient that can simultaneously replace sugar, fortify fibre intake, and moderate blood glucose responses. This shift reflects a growing recognition that long-term health outcomes depend

on overall dietary patterns rather than focusing on single nutrients in isolation. Reformulation is now about creating products with improved nutritional profiles while maintaining the taste and texture consumers expect.

The report highlights significant market opportunities, noting that functional foods and beverages targeting metabolic health are expanding faster than the wider market. Despite rising consumer awareness of blood sugar management, claims in this area remain

underrepresented, leaving room for innovation. Fibre-fortified products are steadily growing, and low-glycemic products command consistent price premiums, underscoring their perceived value. Regulatory pressures are also shaping reformulation strategies, with measures such as Germany's upcoming sugar levy and the UK's ban on high-sugar foods in schools pushing manufacturers toward healthier product development.

Soluble fibre is presented as a key solution, offering multiple benefits without the gastrointestinal discomfort often associated with other fibres.

By slowing digestion, soluble fibre helps reduce post-meal blood glucose spikes, while also supporting prebiotic functions and microbiome health.

Promitor soluble corn fibre has been linked to lower insulin responses, reduced metabolic stress, and improved gut function, with tolerance at doses up to 40 grams per day.

Research also suggests cognitive benefits in older adults, alongside microbiome optimization that may support brain health.

Overall, reformulation strategies must move toward holistic nutritional improvements, integrating fibre enrichment and blood sugar moderation into mainstream

product development. This approach aligns with evolving consumer expectations, regulatory demands, and public health priorities, positioning soluble fibre as a cornerstone ingredient in the future of metabolic wellness.

<https://www.nutritioninsight.com/news/tate-lyle-reformulation-metabolic-health-sugar.html>

Is Fibre The “Next Protein”?

Roquette’s recent webinar positions fibre as the “next protein,” highlighting its emergence as a cornerstone of gut health innovation and a major consumer megatrend.

The company emphasizes that the future of fibre is not about simply increasing intake, but about clinically validated prebiotic fibres that meet the International Scientific Association for Probiotics and Prebiotics (ISAPP) definition. This requires evidence that the fibre is selectively utilized by beneficial microorganisms, produces measurable microbiome changes, and delivers proven health benefits in humans.

Iva François, Roquette’s global product marketing leader for fibres, explains that consumers increasingly link gut health not only to digestion but also to immunity, weight management,

stress, sleep, and overall well-being. Fiber now surpasses probiotics as the top ingredient consumers associate with gut health, yet most populations remain deficient. This creates a strong opportunity for brands to bridge the knowledge-action gap by clearly communicating fibre content, daily intake contribution, and the distinction between generic fibres and clinically substantiated prebiotics.

Nutriose offers high digestive tolerance, slow fermentation, and proven benefits for gut microbiota modulation, satiety, blood glucose management, and metabolic health. It can be consumed at levels up to 45 g/day without discomfort, and its bland taste and stability across heat, pH, extrusion, and shelf-life conditions make it suitable for diverse applications. The ingredient is positioned as a way to enrich everyday foods and beverages without compromising sensory quality.

François stresses that

successful products must balance robust science with consumer experience. She outlines five principles for brands: use clinically substantiated ingredients, prioritize digestive tolerance, preserve sensory quality, ensure formulation performance under processing conditions, and integrate fibre into convenient daily consumption formats. Opportunities extend beyond digestive health claims to areas such as gut-brain axis support, metabolic health, GLP-1 companion nutrition, and preventive wellness.

Ultimately, fibre is becoming a foundational health platform, comparable to protein in its market significance. Brands that translate scientific evidence into enjoyable, accessible products with meaningful fibre levels are expected to lead the gut health megatrend and help close the global fibre gap.

<https://www.nutritioninsight.com/news/roquette-fiber-prebiotic-gut-health.html>

Industrial Dry Extrusion Advances Pulse Protein Production

Crespel & Deiters has partnered with Finnish food-tech company Happy Plant Protein to bring a patented dry extrusion technology into industrial-scale production, marking a significant advance in pulse protein processing.

Operating from its Helmond facility in the Netherlands, the company is now producing textured proteins from European-grown legumes such as peas and fava beans. Unlike conventional air classification, which requires

multiple steps and often chemical or water-intensive processing, this one-step dry extrusion process simultaneously separates flour into protein and starch fractions while imparting functional properties needed for food applications.

The technology eliminates the need for protein isolates and reduces off-flavours, resulting in neutral-tasting proteins that avoid the “beany” notes common in many plant-based ingredients. By preserving more of the raw material, it improves efficiency, lowers carbon footprint, and enhances cost-effectiveness. Strategically, this represents Crespel & Deiters’ evolution from a wheat-focused company into a broader “refiner of raw materials,”

expanding its portfolio to include pea, fava bean, rice, corn, and wheat proteins with tailored functional refinement for texture, water-binding, and bite firmness.

From a sustainability perspective, pulses are well-suited to European climates, supporting crop rotation, soil health, and nitrogen fixation, which strengthens long-term supply resilience. The textured proteins produced through this dry extrusion process offer a distinct alternative to concentrates and isolates, delivering ready-to-use, clean label ingredients for meat alternatives, hybrid products, ready meals, and snacks. Since its introduction, the technology has generated strong interest across the value chain, from

manufacturers to co-manufacturers, reflecting growing demand for regionally sourced, functional plant proteins.

The collaboration is part of a broader strategy to build an ecosystem of novel processing technologies, complementing Crespel & Deiters’ expertise in fractionation, extrusion, modification, and protein hydrolysis. This positions the company to play a leading role in shaping the next generation of plant-based foods by combining sustainability, functionality, and regional sourcing.

<https://www.foodingredientsfirst.com/news/crespel-deiters-dry-extrusion-plant-protein.html>

Flavour Innovation In 2026: Swicy Heat, Tropical Twists and Sensory Surprises

Flavour innovation in 2026 is being defined by bold combinations, tropical influences, and multisensory experiences, with social media accelerating the spread of visually striking and culturally specific flavours.

Manufacturers are under pressure to deliver more than taste alone, creating flavours that balance indulgence with functionality, support sugar and salt reduction, mask protein off-notes, and replicate sensations such as crunch, cooling, or tingling.

One of the most prominent trends is “swicy” — the blend of

sweet and spicy — which has expanded from sauces into beverages, snacks, and desserts. Hot honey, mango habanero, gochujang caramel, and pineapple chili exemplify this mash-up, while cranberry’s tart-sweet profile is being leveraged in spicy formats like chili lime dried cranberries and cranberry hot honey. Tropical fruits such as mango, guava, calamansi, and tamarind are also gaining traction, with mango described as a “playground for innovation” across sorbets, bakery fillings, and yogurt drinks.

Global flavour exploration is becoming more precise, moving away from broad categories like “Asian-inspired” toward specific profiles such as Thai green curry or Japanese katsu curry. Consumers are increasingly interested in the cultural stories behind flavours, using

food as a way to “travel with their tastebuds.” Social media platforms like TikTok and Instagram are driving demand for colourful, shareable flavours such as ube, pandan, and matcha, while Korean-inspired seasonings are entering mainstream retail.

Multisensory experiences are another frontier. Sensient’s “SensEffect” range delivers tingling, numbing, cooling, or heating sensations, adding playful dynamics to eating. Flavour technology is also being used to recreate textures and mask off-notes, with JPL Flavours’ “Crunch ’n Crumble” range simulating crunchy inclusions in dairy bases, and Synergy Flavours’ modulation technology tackling astringency in high-protein products. Kerry is combining flavour chemistry, AI, and consumer insights to uncover novel pairings, such as citrus with fermented or botanical ingredients.

Economic pressures are shaping innovation strategies. Brands are cautious about unfamiliar flavours, opting for limited editions, regional launches, and combinations of familiar anchors with novel twists to reduce risk. The “80:20 approach” — 80% familiarity and 20% novelty — is guiding product development, such as classic proteins finished with

yuzu glaze or comfort foods elevated with Korean BBQ notes.

Looking ahead, flavour trends that combine authenticity, functional relevance, and sensory engagement are expected to dominate. Tropical fruits, tart ingredients that support sugar reduction, sweet-spicy combinations, and Asian-

inspired fusions like caramel miso are poised for growth. As consumers seek affordable indulgence and healthier options, lighter, naturally refreshing flavours such as elderflower and cucumber are anticipated to play a larger role in new product development.

<https://www.foodingredientsfirst.com/news/flavor-trends-swicy-tropical-innovation.html>

Protein Innovation Moves Beyond Fortification

At IFT FIRST 2026 in Chicago, protein innovation was one of the most prominent themes, but the focus has shifted beyond simple fortification.

The conversation is no longer about how many grams of protein can be added to a product; instead, suppliers are working to integrate protein into mainstream foods without compromising taste, texture, or clean label appeal. Plant, yeast, and sweet-protein systems are being designed to perform functional roles such as texturizing, egg reduction, and sugar reduction, while hybrid formulations are gaining traction as developers move away from rigid animal-versus-plant positioning.

Puris introduced H2-IZO, a pea protein designed for high-inclusion applications with lower viscosity, aiming to

replicate the mouthfeel of whey and avoid the heavy or chalky textures often associated with isolates. Ingredient emphasized the importance of matching protein functionality to specific formats, highlighting how solubility, dispersion, and mouthfeel vary between applications like bars and smoothies. The company also showcased products that combine protein and fibre to deliver satiety and nutrition density, reflecting growing consumer interest in fullness, digestion, and GLP-1-related eating patterns.

Clean label considerations are central to this innovation. Proteins that require masking agents, stabilizers, or artificial sweeteners undermine the better-for-you proposition, so ingredient performance in solubility, emulsification, and viscosity is now critical. ICL Food Specialties demonstrated stabilization systems across multiple categories, while Meala FoodTech presented functionalized plant proteins that replace eggs and

hydrocolloids in bakery applications, simplifying formulations and reducing reliance on volatile supply chains. Biolev introduced yeast-derived systems that mimic egg functionality, though with limitations in aeration.

Sweet proteins also featured prominently, with brazzein-based solutions showcased as tools for sugar reduction without the aftertaste of conventional sweeteners. Across the board, the message was clear: protein is evolving from a fortification claim into a multifunctional ingredient that contributes to structure, texture, and sensory appeal. The next phase of protein development will be judged not by how prominently it appears on the label, but by how seamlessly it integrates into everyday foods, delivering nutrition density, satiety, and clean label performance while remaining sensorially unobtrusive.

<https://www.foodingredientsfirst.com/news/ift-first-2026-protein-innovation-trends.html>

Protein Boom Keeps Pressure on Global Whey Market as Supply Struggles to Catch Up

Global whey supplies remain under sustained pressure as demand for high-protein foods and beverages continues to grow faster than production capacity.

Whey, derived as a by-product of cheese manufacturing, has become a cornerstone ingredient in sports nutrition, functional beverages, protein bars, and mainstream high-protein foods.

However, because its availability is tied to cheese output rather than protein demand alone, supply cannot easily expand to meet market needs. Long-term trends such as the mainstreaming of high-protein diets, aging populations seeking muscle health, and the influence of GLP-1 weight-loss medications have intensified demand, making shortages more structural than temporary.

Dairy ingredient suppliers are investing heavily to ease supply constraints. FrieslandCampina announced over €90 million in investments to expand whey protein innovation and optimize production facilities in the Netherlands, including upgrades at Bedum, Workum, and Veghel. These expansions aim to strengthen supply resilience and support high-value whey proteins such as isolates, concentrates, and

micro-particulated whey. Despite these efforts, industry leaders acknowledge that strong underlying demand will keep markets tight, shifting customer conversations toward supply security, reliability, and long-term partnerships. Manufacturers are increasingly seeking not just ingredients but strategic collaboration, technical expertise, and market insight to accelerate innovation.

Hybrid protein strategies are emerging as a practical response to whey supply challenges. Barentz has demonstrated that replacing 20% of whey with alternative proteins can reduce costs by up to 17% while maintaining taste, texture, and solubility. This approach allows manufacturers to balance functionality, cost, and consumer expectations, reducing reliance on a single

protein source. Hybrid systems are moving from niche to mainstream, with applications across shakes, bars, soups, and meal replacements. Caseinates are also being leveraged as complementary proteins, offering better availability and pricing while supporting longer-lasting recovery benefits.

The whey supply situation underscores how protein has shifted from a specialist nutrition category into a mainstream food and beverage expectation. As demand continues to rise, the future of protein formulation will be defined not only by ingredient performance but also by adaptability, strategic sourcing, and collaborative innovation between suppliers and manufacturers.

<https://www.foodingredientsfirst.com/news/global-whey-supply-pressure-protein-demand.html>

What Brands Need to Know Before Pitching Retailers

The winning retail shelf space requires more than a good product and story—it demands a balance of data, retail readiness, and relationship-building.

Experts at the Specialty Foods Association's Summer Fancy Food Show emphasized that while storytelling helps brands stand out, retailers ultimately make decisions based on numbers. Metrics such as velocity, trial rates, and social media traction are critical, with platforms like TikTok now influencing assortment

strategies. Retailers expect brands to demonstrate readiness by understanding promo pricing, competition, consumer behaviour, and the logistics of getting products to stores. Founders are encouraged to think like shoppers, not just entrepreneurs, by observing how people actually navigate aisles.

Relationships remain central to retail success. Founders shared experiences of personally walking into stores with samples, building connections locally before expanding nationally. These grassroots efforts often lead to organic growth as community retailers notice and spread products across

towns. Maintaining these human-to-human connections is essential as brands scale. The mindset shift from selling products to providing solutions is also key. Retailers view shelf space as valuable real estate, and every product must justify its presence by driving sales and supporting store operations. Successful brands position themselves as partners who help retailers meet their goals, not just as suppliers seeking placement. Ultimately, the path to retail success lies in combining strong data with authentic relationships and a deep understanding of the retailer's perspective.

<https://www.foodnavigator.com/Article/2026/07/01/what-brands-need-to-know-before-pitching-retailers/>

Singapore Sees Nutri-Grade Label Success with Lower Sugary Drink Purchases

The study on Singapore's Nutri-Grade labelling system shows that mandatory front-of-pack nutrition labels have had a measurable impact on consumer behaviour and product reformulation.

Implemented in December 2022, the traffic-light style system assigns beverages a grade from A to D based on sugar and saturated fat content, with less healthy drinks (C and D) required to display the label and Grade D drinks banned from advertising.

Analysis of household scanner data from 2019 to 2024 revealed that sugar intake from pre-packaged beverages fell by 18%, equivalent to 3.1 g per day, while purchases of Grade C and D drinks dropped by 44%. At the same time, manufacturers reformulated products to reduce sugar content by 21% overall, ensuring they met thresholds to achieve better grades.



REGULATORY NEWS

However, this reformulation also led to a 6% rise in the use of non-sugar sweeteners across all beverages.

The effects were strongest among households with higher nutrition literacy and income, suggesting that labelling alone is not enough and must be paired with broader nutrition education to reach all consumers. The study also noted changes in dairy-containing drinks, with reformulation reducing saturated fat while increasing lactose.

Researchers emphasize that Nutri-Grade is achieving its intended goals: shifting consumer purchases toward healthier options and pushing companies to cut sugar. Yet they caution that industry adaptations, such as substituting sugar with sweeteners, highlight the need for periodic policy updates.

The findings come as Singapore prepares to extend Nutri-Grade requirements and introduce advertising restrictions on products high in sodium and saturated fat. Globally, similar measures are gaining traction, with sugar taxes spreading across Asia and Europe, though adoption remains uneven. The World Health Organization has urged governments to combine taxes with subsidies for healthier foods to improve affordability and strengthen public health outcomes.

Overall, Singapore's experience demonstrates that mandatory labelling can drive both consumer and industry change, but long-term success depends on coupling policy with education and continuous monitoring of reformulation practices.

<https://www.nutritioninsight.com/news/singapore-nutri-grade-labels-sugar-reduction-reformulation.html>

Novella's Bioreactor Brings Consistency and Climate Resilience to Botanical Ingredients

Novella's Precision Botanicals platform is designed to solve two persistent challenges in the botanical ingredients industry: supply chain instability and variability in plant compound composition.

Traditional botanical extracts depend on agricultural harvests,

which are vulnerable to climate, seasonality, pests, and logistics. They also rely on isolating single molecules, which vary from crop to crop, requiring costly standardization.

Novella's approach uses bioreactors to grow plant cells in controlled indoor environments, eliminating dependence on harvests and ensuring consistency. By preserving the full complex of naturally occurring bioactives rather than isolating one compound, Novella achieves stronger efficacy at lower

concentrations. For example, its first product, *Strawberry[∞]*, delivers maximum efficacy at just 1% of the dosage required by conventional berry extracts.

The system allows precise control of growth conditions — temperature, oxygen, nutrients, and stress signals — to consistently produce the same bioactive profile. This consistency is crucial for functional foods and supplements, where health claims must match the ingredient profiles validated in clinical studies.

Novella's method removes the need for post-production blending or correction, streamlining manufacturing.

The company emphasizes that plant bioactives function as coordinated systems, with compounds working synergistically. Preserving this complexity supports gut health and microbiome function, which Novella sees as the foundation for broader health benefits.

Beyond technical innovation,

Novella highlights sustainability: bioreactor cultivation is climate-resilient and avoids agricultural unpredictability. The industry is increasingly embracing similar methods, such as fermentation-derived ingredients and probiotics. However, regulatory frameworks remain a barrier, as they are designed for conventional agriculture and slow to adapt to controlled-environment technologies. Novella argues that updating regulations to reflect modern production methods would

accelerate access to innovative, consistent, and sustainable ingredients.

In short, Novella positions its platform as a way to deliver reliable, scalable, and climate-resilient botanical ingredients that preserve natural complexity, improve efficacy, and support sustainable nutrition innovation.

<https://www.nutritioninsight.com/news/novella-precision-botanicals-plant-cell-technology-supply-chain.html>

Colour Innovation Breakthroughs Push Natural Shades Beyond the Performance Gap

Natural food colours are undergoing a transformation from being imperfect substitutes for synthetic dyes into engineered, high-performing systems that meet modern food and beverage demands.

Advances in fermentation, encapsulation, plant breeding, and extraction are enabling vibrant, stable, and versatile natural shades that can withstand manufacturing, distribution, and shelf-life

challenges. Companies like dsm-firmenich are focusing on encapsulation and emulsion technologies to protect pigments from heat, light, and oxidation, while also investing in fermentation-derived carotenoids to ensure consistent year-round supply. California Natural Color is innovating with concentrated crystal formats that deliver up to ten times the colour strength of liquid alternatives, improving handling, solubility, and cost efficiency.

GNT is leveraging plant breeding and agricultural programs to boost pigment intensity and resilience, while also tackling difficult shades like blue, green, and purple through spirulina-

based solutions. Oterra is expanding natural blue options with Arctic Blue and Jungle Blue, while also developing advanced delivery systems such as encapsulation and ultra-fine powders to enhance vibrancy and stability.

Across the industry, the shift is clear: natural colours are no longer just replacements for synthetics but are becoming added-value tools that combine functionality, sustainability, and supply resilience, aligning with regulatory pressures and consumer demand for clean labels and transparent sourcing.

<https://www.foodingredientsfirst.com/news/color-innovation-natural-food-colors.html>

Spirulina Blue Gains Ground In F&B Despite Stability, Supply and Regulatory Challenges

Blue spirulina is emerging as one of the most promising natural alternatives to synthetic blue dyes, particularly in confectionery and frozen desserts, thanks to

its vibrant phycocyanin pigment.

Its adoption has accelerated in recent years, supported by consumer demand for clean label ingredients and regulatory shifts such as the US FDA's 2026 expansion of approved uses into bakery and heat-processed categories. Major retailers moving away from synthetic dyes have further boosted

interest, positioning spirulina alongside other natural contenders like butterfly pea flower and gardenia blue.

Despite its appeal, spirulina faces significant technical hurdles. Its pigment is highly sensitive to heat, light, and acidic environments, leading to fading, sedimentation, or mottling in beverages, gummies, and baked goods.

Suppliers are addressing these weaknesses through stabilization technologies, controlled indoor cultivation, and proprietary extraction methods, while recommending strategies such as late-stage incorporation to improve retention. Freezing applications, such as ice cream and popsicles, remain a strong fit since cold conditions do not degrade the pigment.

Supply chain resilience is another challenge. Production is concentrated in a few regions, with China dominating but facing tariffs and geopolitical risks. This has prompted procurement teams to diversify sourcing toward Europe and the US, though scaling up while maintaining quality and competitive pricing

remains difficult. Controlled cultivation environments, such as photobioreactors, are being explored to ensure year-round consistency and pigment strength.

Regulatory frameworks add complexity. In the US, spirulina extracts are authorized as colour additives exempt from batch certification, but in the EU, extracts remain under regulatory uncertainty, with companies often marketing them as foods with colouring properties rather than approved additives. This creates risks for brands making “natural” or “clean label” claims, which must be carefully tailored to each jurisdiction.

Looking ahead, spirulina is widely seen as the frontrunner

for replacing synthetic blue, but its long-term dominance is not guaranteed. Competitors such as *Galdieria sulphuraria*-derived phycocyanin, which has already received FDA authorization and a positive EFSA opinion, are poised to enter the EU market with fewer regulatory ambiguities.

The future of natural blue will likely depend on portfolios of complementary solutions, combining spirulina with other sources and advanced delivery systems to meet the diverse demands of beverages, bakery, confectionery, and frozen desserts.

<https://www.foodingredientsfirst.com/news/blue-spirulina-natural-food-coloring.html>

Businesses Step Up Investment in Protein Diversification but Seek Stronger Policy Support

The World Business Council for Sustainable Development's latest barometer highlights how protein diversification is gaining momentum across the food and beverage industry, driven primarily by consumer demand for healthier, affordable, and minimally processed protein options.

Businesses are responding with increased investment in new crops, fermentation technologies, and hybrid product development, but they emphasize the need for stronger policy support and regulatory alignment to accelerate progress.

China is positioning protein

diversification as a strategic pillar of food security, applying the same coordinated approach that fuelled its solar and electric vehicle sectors. The EU is advancing plant-based diets and next-generation food technologies, with Denmark's national Action Plan for Plant-Based Foods standing out as a model of coalition-building between farmers, policymakers, and businesses. In the US, consumer demand is strong and innovation ecosystems are supportive, but businesses express concern that dietary guidelines remain skewed toward animal protein, creating a less favourable policy environment.

Investment is being driven by three interconnected forces: shifting consumer preferences toward flexitarian and hybrid diets, early positioning in emerging markets through R&D and new technologies, and

resilience strategies to mitigate climate, biodiversity, and supply chain risks. Yet barriers remain, including affordability challenges, slow approval pathways for novel proteins, and policy incoherence across markets. Plant-based alternatives often lack the subsidies or tax advantages enjoyed by animal-based products, limiting consumer uptake.

Leading examples show how coordinated strategies can accelerate progress. Denmark's action plan demonstrates how national frameworks can create jobs and market share, while companies like Griffith Foods, Oatly, and Lidl illustrate how ingredient innovation, retail partnerships, and climate-focused roadmaps can expand protein-diverse portfolios. Looking ahead, embedding protein diversification into food, agriculture, and health strategies will be critical.

Practical policy priorities include updating dietary guidelines to integrate sustainability, fast-tracking regulatory approval for safe novel proteins, piloting transition support for farmers,

and leveraging public procurement in schools and hospitals to normalize diverse protein choices. The report suggests that coherent policy frameworks, aligned incentives, and collaborative pilot

programs will be essential to scaling protein diversification globally.

<https://www.foodingredientsfirst.com/news/protein-diversification-wbcd-barometer-insights.html>



The European Food Safety Authority (EFSA) has significantly tightened its health-based guidance on trifluoroacetic acid (TFA), lowering the acceptable daily intake from 0.05 mg/kg to 0.014 mg/kg of body weight per day — a reduction of about 3.5 times.

For the first time, EFSA also set an acute reference dose of 0.07 mg/kg, reflecting growing concern over short-term exposure. The revision follows new toxicological evidence linking TFA to changes in thyroid hormone levels, particularly thyroxine, which regulates metabolism, growth, and

development.

TFA is a persistent chemical formed when certain PFAS compounds, including pesticide active substances, degrade. It accumulates in soil, groundwater, and crops, raising concerns about contamination in food systems. While EFSA's opinion does not impose new legal limits, it will inform EU discussions on pesticide approvals, residue monitoring, and consumer protection measures. Member states already track PFAS in food and water, and the lower thresholds are expected to influence future exposure assessments and regulatory decisions.

The assessment drew on pesticide evaluations, EFSA's prior reviews of PFAS degradation, studies from the European Chemicals Agency, and industry submissions. A

public consultation also contributed, with 177 stakeholder comments considered. EFSA acknowledged uncertainties remain around TFA's long-term toxicity, carcinogenicity, and developmental immunotoxicity, and incorporated an additional uncertainty factor into its calculations.

This move is part of broader EU efforts to strengthen PFAS regulation. EFSA and ECHA are continuing joint work to assess how PFAS-containing pesticides degrade into TFA and how the substance behaves in soil and water. That study, expected in 2027, could provide further evidence to guide EU policy on PFAS, pesticides, and food safety.

<https://www.foodingredientsfirst.com/news/efsa-lowers-trifluoroacetic-acid-threshold.html>

Sweet Protein Blends Drive Next-Gen Sugar Reduction

The sweet protein blends are emerging as a next-generation solution for sugar reduction in food and beverage applications.

At IFT FIRST 2026, innovators showcased how these proteins can deliver sweetness without the drawbacks of traditional sugar or artificial sweeteners. Unlike conventional sugar substitutes, which often

struggle with aftertaste, off-notes, or limited functionality, sweet proteins are naturally occurring molecules that can be harnessed to provide clean, pleasant sweetness with minimal calories.

These blends are designed to provide clean label appeal, improved taste profiles, and functional versatility across categories like beverages, dairy, and confectionery. Their protein nature means they can

integrate seamlessly into formulations, offering not only sweetness but also potential nutritional benefits. For example, some sweet proteins are derived from plants such as katemfe fruit or monk fruit, and their extraction and formulation processes are being refined to ensure scalability and cost-effectiveness.

By leveraging protein-based sweetness, companies aim to meet consumer demand for healthier, lower-sugar products while maintaining indulgence and flavour.

This is particularly important as global health authorities continue to emphasize reducing added sugar intake, and as consumers increasingly scrutinize ingredient lists for artificial additives. Sweet proteins offer a way to achieve sugar reduction targets without compromising taste, which has historically been the biggest barrier to consumer acceptance of low-sugar products.

The technology reflects a broader industry push toward natural, sustainable ingredients

that balance nutrition with sensory performance. It also aligns with the clean label movement, where transparency, simplicity, and natural sourcing are key drivers of consumer trust. Beyond taste, sweet proteins may help manufacturers reduce reliance on synthetic sweeteners like aspartame or sucralose, which face regulatory and reputational challenges.

In the long term, sweet protein innovation could reshape the sugar reduction landscape by enabling new product

categories, from indulgent desserts to functional beverages, that deliver sweetness in a healthier, more sustainable way. The excitement underscores how these proteins are not just a niche innovation but a potential mainstream solution, bridging the gap between consumer health priorities and the sensory expectations that make food enjoyable.

<https://www.foodingredientsfirst.com/news/sweet-protein-blends-drive-next-gen-sugar-reduction-at-ift-first-2026.html>

US FDA Removes Orange B Authorization, Targets Citrus Red No. 2

review, with public comments accepted until August 24, 2026 before a final decision is made.

The US FDA has revoked authorization for Orange B and proposed revoking Citrus Red No. 2, citing their outdated use in the food industry.

Orange B, previously permitted for colouring sausage and frankfurter casings, will be banned effective September 8, 2026. Citrus Red No. 2, used for colouring orange peels, is under

The FDA concluded that both petroleum-based dyes are no longer used commercially, aligning the move with broader efforts to modernize food safety regulations and support the industry's transition toward natural colour solutions. This action is part of a wider push to eliminate synthetic dyes, with natural alternatives such as fermentation-based beetroot

red, crystal carrot red, and other plant-derived pigments gaining traction.

Officials emphasize that the revocations reflect current industry practices and public health priorities, while also supporting consumer demand for cleaner, more natural ingredients. The decision underscores the FDA's strategy of phasing out petroleum-based additives in favour of safer, more sustainable options.

<https://www.foodingredientsfirst.com/news/fda-revokes-petroleum-food-colors.html>

Codex Adopts Its First Global Baker's Yeast Standard to Align Trade and Quality Requirements

Codex has adopted its first global standard for baker's yeast, establishing common definitions and requirements for product forms, composition, additives, labelling, storage, and testing.

The framework applies to yeast produced from pure strains of *Saccharomyces cerevisiae* and used as a leavening agent in bakery applications. It divides yeast into fresh formats (block, compressed, granulated, crumbled, liquid, cream) and dry formats (active, instant, semi-dry), with specified moisture and pH ranges.

The standard also aligns food

additive provisions with the Codex General Standard for Food Additives, permitting functions such as emulsifiers, stabilizers, humectants, and antioxidants depending on format. It references AOAC and ISO methods for analytical consistency and recommends adherence to Codex hygiene principles. While it does not set universal fermentation or leavening thresholds, it provides a technical benchmark for quality assurance and procurement.

Codex standards are voluntary, requiring national adoption to become enforceable, but they often serve as international reference points under WTO agreements. This yeast standard could simplify sourcing, quality checks, and trade by harmonizing specifications across markets.

The proposal originated in 2021 from Angel Yeast and the China National Research Institute of Food and Fermentation Industries, later developed with input from 25 Codex members and co-chaired by France and Türkiye. Angel Yeast contributed technical expertise

but does not own the standard, which now stands as an intergovernmental framework to support global alignment in the baker's yeast industry.

<https://www.foodingredientsfirst.com/news/codex-global-bakers-yeast-standard.html>

Clean Label Reformulation Moves Beyond Ingredient Swaps

The clean label reformulation is evolving from simple ingredient removal to complex system-level solutions.

Manufacturers are under pressure to reduce synthetic preservatives, nitrites, phosphates, sodium, and sugar, but reformulation must still ensure food safety, shelf life, taste, and processing performance. Suppliers are responding by developing multifunctional ingredient systems and digital tools that streamline formulation and improve factory efficiency.

Prosur emphasized “protecting food with food,” using compounds from citrus and rosemary to replace nitrites and phosphates without compromising safety, shelf life, or sensory qualities. Their approach relies on natural

antioxidants like polyphenols and flavonoids to replicate preservation functions.

Samyang showcased Fibernova, a crystalline kestose ingredient, alongside its AI-powered 3S Solution platform, which helps manufacturers balance sugar reduction with texture, sweetness, and cost. Rather than relying on a single ingredient, Samyang's system integrates fibres, sweeteners, and flavour modulators to maintain product performance.

Daesang introduced Dsavory, a portfolio of fermentation-derived natural flavours that build layered umami and meaty notes. These systems support sodium reduction, replace conventional flavour enhancers, and optimize costs by reducing reliance on dairy powders. Their UH, LH, and MH variants target different stages of flavour delivery, reinforcing the idea that reformulation depends on tailored solutions for specific

food matrices. Galactic added another dimension by focusing on ingredient format rather than function. Its Galimax Flavor V-100 Pearls, a granulated vinegar preservative, reduce dust, caking, and handling issues while maintaining the same antimicrobial performance and clean label declaration as powdered vinegar.

Across the show, the strongest innovations addressed the consequences of removing additives rather than the removal itself. Companies demonstrated how reformulation can simultaneously protect food safety, rebuild sensory qualities, improve processing efficiency, and optimize costs. The emerging model is not about one-for-one swaps but about coordinated systems that safeguard both product integrity and commercial viability.

<https://www.foodingredientsfirst.com/news/ift-first-clean-label-reformulation-systems.html>