



PFNDAI

FOOD, NUTRITION & SAFETY MAGAZINE

BULLETIN AUG 2026

Understanding Labelled Nutritional Information

And Its **Substantiation**

Ms Arti Gupta & Ms Sharadha Arun

Speciality Emulsifiers for Innovative and Healthier Food Products

Enabling Better Nutrition, Functionality
and Consumer Appeal
Mr Ganesh Devsarkar

Effect of Parboiling on Techno-Functional Properties of Millets

Dr Usha Dharmaraj &
Dr Sridevi Annapurna Singh

How **Safe** Are Our Food Preservatives?

Ms Sanyukta Telange &
Dr. Malathy Venkatesan

Iron Fortification Through **Food**: Making Every Milligram Count

Ms Simran Vichare

Beyond the Wrapper: The New Era of Food Packaging Innovation

Ms Samreen Shaikh

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INDEX



COVER STORY 1

Fine Organic Industries Ltd,
Food Ingredient Specialities,
Marico,
Vasta Biotech,
Mondelez,
Zydus Wellness,
Modern Dairies,
Bee Pharmo Labs,
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ADVERTISERS

Editorial

Regulatory Viewpoint By Dr Lewis

Understanding Labelled Nutritional Information 1
and its Substantiation
By Ms Arti Gupta & Ms Sharadha Arun

Speciality Emulsifiers for Innovative and 6
Healthier Food Products
Enabling Better Nutrition, Functionality and Consumer Appeal
By Mr Ganesh Devsarkar

Effect of Parboiling on Techno-Functional 12
Properties of Millets
By Dr Usha Dharmaraj & Dr Sridevi Annapurna Singh

How safe are our food preservatives? 20
By Ms Sanyukta Telange & Dr Malathy Venkatesan

Iron Fortification Through Food: Making 26
Every Milligram Count
By Ms Simran Vichare

Beyond the Wrapper: The New Era of Food 32
Packaging Innovation
By Ms Samreen Shaikh

Regulatory Round Up 38
By Dr. Shashank Bhalkar

Research in Health & Nutrition 39

Food Science and Industry News 51

Regulatory News 61

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Food Fortification: The Cost-Effective Solution to Malnutrition

Recently, a very nice and comprehensive economic analysis of food fortification was published in the Journal of Nutrition by scientists from Cochrane Collaboration, the Food Fortification initiative, Emory Univ. and Techno Serve after reviewing large number of studies from across 63 countries including 40 from low- and middle-income economies (<https://www.sciencedirect.com/science/article/abs/pii/S0022316626000301>).

It highlighted that fortifying staples like flour, rice, salt, milk and oil with micronutrients like iron, folic acid, vitamin A and iodine delivers significant benefits that is very cost effective. The evidence shows that these interventions reduce the conditions such as anemia, neural tube defects in newborn babies, blindness and cognitive impairments. This offers high returns on investment measured in disability-adjusted life years (DALYs) averted.

The study emphasized that fortification is particularly impactful in low- and middle-income countries, where the burden of micronutrient deficiencies is greatest. However, it also benefits all the economies showing the universality of advantages.

We have already the FSSAI approved fortification scheme that not just allows fortification but also lets these fortified products carry a specially designed logo to promote these staples. However the promotion of such products would be more effective if ICMR & NIN were to actively support fortification and guide people to consume such staples to prevent micronutrient deficiencies.

Secondly, we feel that even macronutrient deficiency should be tackled similarly as protein and dietary fibre deficiency has been creating some problem to a large population lately because of the changes in the dietary habits.

Protein and fibre fortification is not as simple as micronutrient

fortification although the latter has some of its own technical difficulties. However, because of the small amounts needed of micronutrients, it does not affect greatly the processing as well as acceptability problems such as texture, mouthfeel and taste that are altered due to macronutrient fortification.

This needs a lot of attention to the fortificant to be used as well as some of the other substances including the ingredients and additives that are needed to make the fortification affecting the sensory properties.

We must accept that we have protein and fibre deficiencies especially among urban population. Just telling people to change the diet and eat more of protein and roughage does not work as they want to eat what they are used to and what is available to them at the prices they can afford. Dr Devi Prasad Shetty has said, "If the solution is not affordable and accessible, it is not a solution!"

Prof Jagadish Pai, Editor,
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Tell us our Food is Safe



AUTHOR

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When you sit down for a meal, your primary concern is: "How safe is my food?" not "How many failures do we have?"

Public communication is so heavily skewed towards sensationalism that consumers are never certain and always worried. As pointed out (PFNDAI; June 2026), regulators bundle failures - substandard, mislabelled, and unsafe food - under the umbrella term "adulteration" or nonconformance, painting a grim picture of an incorrigible industry. The media takes its cue from here.

This alarming narrative collapses when the same data is examined and categorised by

health risks. If you want to know "how safe your food is", separate unsafe food, and a completely different reality emerges. More than 96% of the food supply reaching over 350 million households is safe. Contrary to its public portrayal, the food industry's performance is neither a laggard nor a systemic failure.

FSSAI misses safe food facts due to its preoccupation with nonconforming products. When viewed through the lens of toxicology and safety sciences (FSSA 2006), national test data indicate that 96.3% of food is safe for consumption. In FSSAI's 2018-19 report, for the first time, the term "adulteration" was unbundled, offering greater transparency.

Of 1,06,459 samples tested, actual "unsafe" foods were 3900 (3.7%), while substandard (16,870; 15.8%) and misbranded labels (9654; 9%) were noncompliant but safe. This safety metric has remained remarkably stable over time, as reflected in a previous

summary (2011-2016) by GNCT (Delhi), placing unsafe food at 3.6%; other FDA data were unavailable.

The safety trend continues, though not in the media. A provisional test report (2025-26) presented to Parliament revealed that 40,023 (17.9%) of 2,23,808 samples were nonconforming. The media quickly posted: "1 of 5 food products failed to meet food safety standards", implying a dangerously high-risk environment, ignoring the 82.1% that conformed.

When selective data is released, highlighting only failures, its unintended consequences discredit the food sector and create unnecessary consumer panic. With a consistent safety index of 96% across 1.4 billion consumers, the sector's performance shifts dramatically. No other single regulatory jurisdiction or economic bloc on Earth faces a demographic challenge of this magnitude.

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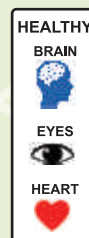
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Food Category Landscape

Not all nonconformance equals unsafe food.



India's challenge is on another planet: a large population, unique supply ecosystem, and a diverse manufacturing makeup. Its supply chains are unlike Western countries - they are not linear but giant agglomerated hubs.

Its best example is milk: a highly perishable food moved through a highly vulnerable, multi-tiered agglomeration of 80 million suppliers and collection hubs, yet the world's largest producer. Second, the food sector, with over 75 lakh FBOs, comprises an overwhelming 83 % registered and 17% licensed entities: a regulatory challenge - again, non-existent elsewhere.

This sheer volume and diversity of supply should convince the regulator and food industry, beyond doubt or delay, that inspection models won't work: it's a trap for incessant pleas for more manpower and endless laboratory testing.

Running faster to stay in the same place is the precise administrative burden that led Parliament to enact the modern risk-based Food Safety and Standards Act (2006). Frequent inspections tell us what went wrong yesterday; systems ensure it does not go wrong again tomorrow: failure reduction, not repetition, is the idea.

Finding fungus on walls, flies in food, and Aflatoxin M1 in milk does not happen only on inspection days; these are persistent and prevalent phenomena. The regulator needs to ask why its own monitoring systems failed to catch this earlier and why it is recurring.

Administrative oversight without proper and relevant scientific rigour cannot identify risks embedded in a supply chain. When the same defects return every year, it means the

root cause remains undiscovered or unresolved.

Answering this would move the regulatory framework away from a disjointed, reactive, publicised inspection model to a preventive and science-based predictive model.

Begin by changing the language of failure to one of challenging goals - tell us our food is safe and it's only getting better. Move to a system that keeps in touch with businesses regularly, not by descending upon them. Distinguish the chronic offender from the compliant that faltered; weed out the former, correct the latter.

The regulator must pivot from a bureaucratic enforcement role to a data-driven safety partnership with Industry. Collaboration, not confrontation, will get us to where we want to be: that's what FSSA, 2006 promised.





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Understanding Labelled Nutritional Information And Its Substantiation

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Introduction:

It is well established that label is the primary communication interface between a food business and consumer. Nutritional labelling has always played an indispensable role in informing the consumers about the product and enabling them to make wise choices. Nutritional labeling helps consumers to compare food products, analyze the requirements and make an informed choice.

This article will discuss the salient features of

nutrition information panel and nutrition/health claims made on food labels and their substantiation.

Nutritional Labelling – Past, Present and Future

At a global level, Guidelines on nutrition labelling was first established by CODEX ALIMENTARIUS commission in 1985(1) which brought the importance of nutritional labelling to the forefront. The United States Food and Drug Administration (US FDA) mandated nutritional labelling in terms of

declaring about sixteen mandatory parameters in 1995 (2). Followed by United Kingdom where a voluntary nutrition labelling guideline was introduced in 1996 (3), which mandated nutrition labelling only when a claim is made. This was part of implementing the EU directive on food labelling (4).

In India, nutrition labelling was first introduced in 2006 (5), when food safety was still primarily governed under Prevention of Food Adulteration Act (1954). Gazette notification GSR 491 was published on 21st Aug 2006 and implemented from 1st Jan 2008. The regulation introduced nutrition information table to Indian food labels. It mandated declaration of energy, protein, fat (trans fat, saturated fat) and carbohydrate (sugar) per 100g/ 100ml basis.

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Tolerances for declaration were as per the storage conditions, analytical methods and shelf life of the product. These regulations were as is implemented by FSSAI in 2011.

It was in 2020 (6) that FSSAI overhauled the Labelling and display regulation, taking into account the global developments, consumer needs and industry practices. The salient changes brought about by FSSAI gazette notification File no. 1-94/FSSAI/SP/Labelling/2014/(Pt.2) dated 17th Nov 2020. Key changes brought about were:

- ✓ Mandatory per serve declaration in addition to per 100g/100ml
- ✓ Include amount of food in gram for reference beside the serving measure and number of servings in package
- ✓ %RDA declaration per serve for energy, total fat, saturated fat, trans fat, added sugar and sodium
- ✓ Clear definitions of nutrients
- ✓ Calculation method for energy, protein
- ✓ Applies a -10% tolerance for declared nutrient values, meaning that the actual nutrient content

should not be less than 90% of the declared value during the product's shelf life.

While detailed ingredient lists along with nutritional information panel and %RDA declaration provide enough information to influence healthier choice. Now into 2026, regulators globally are exploring interpretative nutritional to further aid consumers with faster decision making. In India also, Front of Pack labelling can further assist consumers, provided not every food is red/ high (to be discouraged), criteria cater to the diverse food options in India and format is easy to understand. Any FOPNL labelling needs to come with a comprehensive consumer awareness campaign.

Substantiation – the base for nutritional label

Substantiation of information on labels is rudimentary to label development. It is essential to provide science backed data to the consumers in a food label. Substantiation not only helps to meet regulatory expectations, but it also helps build consumer trust in a brand over years.

Key elements of substantiation include:

- **Serving information:** Serving size should reflect a realistic and justified

consumption quantity based on the intended use and design of the product. Businesses should refrain from altering serve size arbitrarily to make nutritional information look good.

- **Macronutrient values:** Nutritional values should be established using validated analytical methods. Periodic verification through FSSAI-recognized third-party laboratories is recommended, supported by routine review of formulations and product specifications.
- **Nutrient calculations:** Calculations for nutrient content and percentage Recommended Dietary Allowance (%RDA) should be based on current and recognized reference standards, such as the latest ICMR Nutrient Requirements for Indians, and updated whenever regulatory or scientific guidance changes.

Together, these measures help ensure that nutrition information remains accurate, credible, and representative of the product throughout its lifecycle.

Claims: Balancing compliance and consumer trust

Claims are a description of the properties/ characteristics of the product that enable the consumer make wise choices as per needs.

Claims must be truthful, unambiguous, meaningful, not misleading. In order to ensure this, regulatory oversight is required. FSSA (advertisement and claims) regulation 2018 (7) provides detailed criteria and conditions for making claims.

Further, FSSAI is in the process of bringing more clarity on Claim approval process (under new ePAAS portal) and Draft guidelines on Human intervention studies.

For claim approvals, FSSAI's New ePAAS portal

(Electronic Product and Claim Approval Application System) has been launched this month i.e. June 2026 (8). Key information required for a claim approval application includes:

- Claim statement and justification- how the claim will be clear and meaningful to help consumers comprehend the product information
- IPR related rights, if any along with documentation
- Scientific substantiation (including cause-effect relation for DRR)



- Safety data and validated method of analysis of the ingredient/ substance for which claim is made

FSSAI has also issued Draft guidelines on Human Intervention Studies (HIS) for all clinical trials conducted to demonstrate the safety and efficacy of foods, food ingredients, nutraceuticals, and novel

Types of nutrition and health claims:

Type of Claim	Substantiation
Nutrition Claim – Nutrient Content Claim (e.g., Source of Protein, High Fibre, Low Fat, Low Sodium, Rich in Vitamin C)	• Nutrient must meet the conditions specified in Schedule I of the FSS Advertising & Claims Regulations. • Analytical testing data/Certificate of Analysis demonstrating compliance with the applicable threshold. • Nutrient declaration in the Nutrition Information Panel. • Scientific justification and formulation records supporting the declared nutrient level.
Non-Addition Claims (e.g., No Added Sugar, No Added Salt, No Added Preservatives)	• Complete formulation review demonstrating absence of the added ingredient/additive including Ingredient specifications • Product analytical data where applicable. • Required disclaimer such as “Contains Naturally Occurring Sugars” where applicable.
Health Claim – Nutrient Function Claim	• Current scientific evidence supporting the physiological role of the nutrient. • Product should contain the nutrient at levels meeting source/ high criteria in Schedule I where applicable. • Nutrient quantification through testing. • Nutrient declaration on label.
Health Claim – Product Led Claim	• Scientific substantiation demonstrating the claimed beneficial physiological effect. • Human studies and published scientific literature, where relevant.
Reduction of Disease Risk Claim	• Compliance with conditions specified in Schedule III. • Prior FSSAI approval if the claim is not already specified in the regulations.

foods in India (9). Key steps enlisted are:

- Pre-approval activities: compound identification, literature review, study design
- Procuring FSSAI NOC to conduct HIS
- HIS execution: outlines requirements for study design, ethics committee approvals, participant enrollment including consent, observations recording
- Post HIS activities: statistical analysis of observations, data generation, adverse event reporting

This puts consumer protection and safety on the forefront, while also actively encouraging food businesses to focus on formulations that support consumer well-being.

Conclusion

Nutritional labelling has evolved from a regulatory requirement into a critical tool for consumer education, transparency, and informed decision-making. As consumers increasingly rely on label information to assess the nutritional quality of foods, the accuracy and credibility of declared values have become more important than ever. Regulatory frameworks across the globe, including those in India, emphasize not only on the declaration of

nutritional information but also the scientific substantiation that supports such declarations.

Robust substantiation through validated analytical methods, sound nutrient calculations, realistic serving size determinations, and adherence to recognized scientific standards forms the foundation of reliable nutrition labelling. Emerging regulatory initiatives such as Front-of-Pack Nutrition Labelling (FoPNL), claim approval framework through ePAAS and guidance on human intervention studies demonstrate the growing focus on transparency and consumer protection.

Ultimately, effective nutritional labelling is a shared responsibility between regulators and food businesses. While regulators establish the framework for truthful and meaningful communication, food businesses must ensure that every nutritional declaration is accurate, scientifically supported, and reflective of the product throughout its shelf life. Together, these efforts help foster consumer trust, encourage healthier food choices, and contribute to a more informed and responsible food ecosystem.

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9. <https://epaas.fssai.gov.in/> under Forms/Formats/ SOP/Guidance

Speciality Emulsifiers

for Innovative and Healthier Food Products

Enabling Better Nutrition, Functionality and Consumer Appeal

AUTHOR

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Introduction

The global food industry is undergoing a significant transformation driven by evolving consumer expectations. Today's consumers are seeking products that offer not only superior taste and texture but also improved nutritional profiles, clean-label credentials, reduced fat content, allergen-free formulations, and enhanced sustainability. This shift has compelled food manufacturers to rethink traditional formulations and adopt ingredient technologies that support both innovation and health.

Among the many functional ingredients available to food technologists, emulsifiers occupy a uniquely critical position. Traditionally known for their ability to

stabilize oil-water systems, modern speciality emulsifiers have evolved far beyond their conventional role. They now contribute significantly to texture optimization, fat reduction, shelf-life enhancement, process efficiency, ingredient replacement, and overall sensory improvement.

Recent advancements in emulsifier technology have enabled manufacturers to formulate healthier bakery products, develop allergen-free chocolate systems, improve stability in nutritional spreads, and create products with reduced saturated fat content without compromising consumer acceptance. These speciality solutions are becoming indispensable tools for food innovation.

Understanding the Role of Emulsifiers

An emulsifier is a surface-active molecule possessing both hydrophilic and lipophilic properties. This dual functionality enables emulsifiers to interact simultaneously with water and fat phases, creating stable food systems.

Beyond simple emulsion stabilization, speciality emulsifiers today perform several functions:

- Improvement of dough strength and machinability
- Enhanced aeration and volume in bakery products
- Fat reduction while maintaining texture
- Control of viscosity in chocolate processing

Speciality Emulsifiers for Innovative and Healthier Food Products
Enabling Better Nutrition, Functionality and Consumer Appeal

- Oil separation prevention in spreads
- Shelf-life extension
- Improved product consistency
- Better release characteristics during processing

As food manufacturers seek healthier formulations, emulsifiers increasingly serve as formulation tools rather than merely processing aids.

Healthier Bakery Products Through Specialty Emulsifier Systems

The bakery sector remains one of the largest consumers of emulsifier technology. Modern consumer demand for high-fibre, millet-based, whole-grain products presents a challenge because these formulations often compromise texture, volume, softness, and shelf life. Speciality emulsifier systems can effectively bridge this gap.

Improving Millet and High-Fiber Bread Quality

Millet-based breads such as ragi (finger

millet), jowar, and bajra are gaining popularity due to their nutritional benefits. They provide:

- Higher dietary fibre
- Essential minerals
- Lower glycaemic response
- Improved satiety
- Better nutritional diversity

However, the absence or dilution of gluten often results in reduced loaf volume, denser crumb structures, and poor softness. Advanced emulsifier systems help overcome these challenges by: 1. Improving oven spring, 2. Enhancing gas retention, 3. Increasing water absorption, 4. Improving crumb structure, 5. Extending softness during storage & 6. Providing better tolerance to mechanical stress during processing.

Studies and industry trials have demonstrated that speciality emulsifier blends can significantly improve the quality of millet-enriched breads while maintaining the nutritional advantages of the grain. The in-house studied data demonstrated improved oven spring, softer crumb texture, enhanced water absorption, and better processing tolerance in ragi bread formulations using specialized emulsifier systems.

Supporting Millet-Based Rusks

Millet-based rusks present a

unique challenge because higher fibre levels can affect dough development and finished product texture. Functional emulsifier systems help improve dough handling properties while maintaining crispness and overall eating quality. As consumers increasingly seek healthier alternatives to conventional refined-flour bakery products, emulsifiers play a pivotal role in making such products commercially viable.

Fat Reduction in Cookies Without Sacrificing Quality

Consumer awareness regarding excessive dietary fat intake continues to grow. This has created significant opportunities for reduced-fat bakery products. Unfortunately, fat contributes to several critical quality attributes in cookies: Tenderness, Mouthfeel, Spread characteristics, Flavour release and Crunchiness. Reducing fat often results in undesirable texture and compromised sensory quality.

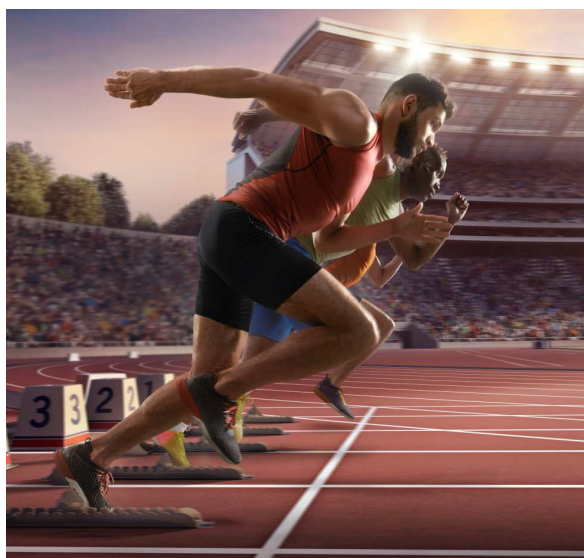
Emulsifier-Assisted Fat Reduction

Modern speciality emulsifier blends enable manufacturers to reduce fat levels while maintaining desirable product characteristics. Application studies have demonstrated successful reductions of up



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to 10% fat in cookie formulations while retaining:

- Desired spread ratio
- Crunchiness
- Uniform baking performance
- Improved cream density
- Good machinability

The mechanism involves improved distribution of fat throughout the dough system and enhanced interaction between flour and fat components. Such systems allow manufacturers to meet nutritional objectives while maintaining consumer acceptance. This approach aligns well with public health recommendations encouraging moderation of dietary fat intake without compromising enjoyment of food.

Emulsifiers in Cream Biscuits and Fillings

Cream-filled biscuits require highly stable cream systems to ensure consistent quality throughout shelf life. One of the most common challenges is oil migration and phase separation, which can lead to: 1. Visual quality defects, 2. Texture

deterioration and 3. Consumer dissatisfaction. Specialized emulsifier technologies significantly improve the stability of cream fillings by:

- Reducing oil separation
- Improving cream structure
- Maintaining texture consistency
- Enhancing storage stability

Application trials have shown superior cream stability and lower water activity in emulsifier-based systems compared with conventional lecithin-only formulations. Improved cream stability and reduced oil separation were observed in cream biscuit applications utilizing specialized emulsifier technology.

Transforming Chocolate Manufacturing

Chocolate processing is heavily dependent on rheological control. Manufacturers continuously seek solutions that improve flow properties while minimizing costly ingredients such as cocoa butter. Traditional systems rely heavily on lecithin. However, growing demand for allergen-free, non-GMO, and high-performance alternatives has accelerated the development of advanced chocolate

emulsifiers.

Lecithin Replacement Technologies

Ammonium phosphatides (E442) represent an important innovation in chocolate emulsification. Key advantages include:

- Allergen-free functionality
- Non-GMO positioning
- Improved viscosity reduction
- Enhanced flow characteristics
- Better oxidative stability
- Ease of handling

Compared with conventional lecithins, advanced phosphatide systems can offer superior viscosity control while preserving chocolate flavour and texture. The use of such alternatives is particularly relevant as manufacturers seek to address allergen concerns while maintaining processing efficiency.

High-Performance PGPR Solutions

Polyglycerol Polyricinoleate (PGPR, E476) remains one of the most effective chocolate flow improvers. Advanced PGPR

technologies provide:

- Significant reduction in Casson yield value
- Improved fluidity
- Better mould filling
- Reduced enrobing defects
- Potential cocoa butter reduction
- Improved processing efficiency

When combined with complementary emulsifier systems, these solutions can dramatically improve chocolate processing economics.

Cocoa Butter Reduction: Economic and Nutritional Benefits

Cocoa butter is one of the most expensive ingredients in chocolate production. Reducing its usage while retaining optimal processing characteristics represents a major objective for manufacturers. Speciality emulsifier combinations have demonstrated the ability to: 1. Improve viscosity control, 2. Reduce yield value, 3. Maintain processing quality and 4. Enable partial cocoa butter reduction

In practical applications, optimized emulsifier systems have achieved comparable or improved rheological performance at lower total fat levels than conventional lecithin-PGPR combinations. Formulations combining specialized phosphatides and high-performance PGPR demonstrated lower viscosity and reduced Casson yield values while operating at reduced fat levels compared with conventional systems. Such improvements contribute not only to cost optimization but also support the development of

products with lower total fat content.

Oil Separation Control in Nutritional Spreads

Oil migration remains a major challenge in products such as: Peanut butter, RUTF (Ready-to-Use Therapeutic Foods), Chocolate spreads, Tahini and Nut and seed pastes. Consumers often associate visible oil separation with poor product quality.

Oil Binder Technologies

Specialized oil-binding emulsifier systems provide significant benefits:

- Reduced oil separation
- Enhanced matrix stability
- More uniform appearance
- Improved shelf life
- Better consumer acceptance

These systems are particularly valuable in nutritional products designed for vulnerable populations where physical stability directly impacts usability and acceptance. The importance of stable Ready-to-Use Therapeutic Foods continues to grow globally, especially in child nutrition and humanitarian feeding programs.

MCT-Based Functional Solutions

Medium Chain Triglycerides (MCTs) are increasingly

utilized in health-oriented food products due to their unique metabolic properties. Beyond their nutritional role, MCT-based systems provide functional advantages including:

- Neutral taste and odour
- Excellent oxidative stability
- Improved shelf life
- Clean-label positioning
- Compatibility with keto-friendly formulations

Applications continue expanding in Jellies for glazing, Nutritional bars, Energy bars, Functional snacks and Specialty confectionery. These developments illustrate how emulsifier-related technologies can simultaneously improve product functionality and nutritional positioning.





The Future of Specialty Emulsifiers

The future of food emulsification will be shaped by several trends:

Plant-Based Growth: The rapid expansion of plant-based foods requires advanced emulsification solutions capable of creating dairy-like and meat-like textures.

Nutritional Enhancement:

Products with reduced fat, reduced sugar, increased fibre, and improved protein content will depend heavily on specialty functional systems.

Sustainability:

Manufacturers continue seeking emulsifiers derived from sustainable and non-GMO sources.

Personalized

Nutrition: Functional ingredients will increasingly support customized nutritional solutions for specific consumer groups.

As these trends accelerate, speciality emulsifiers will become even more important in balancing nutrition, functionality, affordability, and sensory quality.

Conclusion

Speciality emulsifiers have evolved from simple processing aids into strategic formulation tools that enable healthier, innovative food products.

Whether improving the quality of millet-based

bakery products, enabling fat reduction in cookies, enhancing cream stability, optimizing chocolate rheology, reducing cocoa butter requirements, or preventing oil separation in nutritional spreads, these ingredients play a pivotal role in modern food development.

The industry's challenge is no longer merely to produce food that tastes good. Today's objective is to deliver products that combine health, functionality, sustainability, affordability, and consumer appeal. Specialty emulsifier technologies provide a powerful pathway toward achieving this balance.

As consumer expectations continue to evolve, food manufacturers that effectively leverage advanced emulsifier systems will be best positioned to deliver the next generation of healthier and more innovative products.



Effect of Parboiling on Techno-Functional Properties of Millets

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Global food systems are unsustainably depleting and statistics reveal approximately 33% soil degradation and 20% over-exploitation of global aquifers. Millets, the ancient cereal grains, require lower fertilizers, gluten-free, nutrient dense, high in antioxidants and rich in fiber (gut health), are thermo-tolerant, drought resistant and therefore, a sustainable alternate source of healthier food (<https://www.fao.org/europe/news/detail/millet---a-forgotten-grain-with-major-potential/en>).

Additionally, livelihood and incomes of small farmers can improve through millet cultivation thereby eradicating poverty. Thus, several sustainable development goals (SDGs) like SDG2 (zero hunger), SDG3 (good health and well-being), SDG12 (sustainable consumption and production) and SDG13 (climate action) can be achieved by cultivating millets. India is the largest producer of millets in the

world and accounts for 40 – 42% of the global production of 28 – 30 million metric tons. India and Africa together produce ~94% of the millets globally (*USDA Foreign Agricultural Service and FAO databases*). Propelled by India's initiative, the UN recognized the significance of these "nutri-cereals" by declaring an International Year of Millets in 2023.



Millets are processed using different methods. Parboiling is one of the traditional processing methodologies, which can be conveniently adopted to millets. Parboiling can be defined as partial boiling of grains or cereals, i.e., cooking the cereals in limited amount of water resulting in partial gelatinization of the starch. Often, husked grains like paddy are subjected to parboiling by soaking in hot water, steamed using low pressure, dried and milled like raw rice. It is reported that, parboiled rice, consumed in many Indian states, is comparatively rich in nutrients specifically B group vitamins (Rocha-Villarreal et al., 2018). Being water soluble, vitamin B moves with water into the kernel during the soaking process, leading to fixation and, the fat components, being lower in density, move towards the periphery of the kernel (Bhattacharya, 2011). Since, the fat components are moved to outer layers of the kernel, polishing of parboiled rice becomes slightly tedious, as oil oozes out of the bran resulting in under-polishing of rice which renders it to be nutritionally superior to highly polished raw rice.

Industrial parboiling process helps nutrients migrate from the bran layers into the endosperm of the grain (starchy centre) and also changes the starch structure. The rice produced is more nutritious, cooks firmer and is less sticky compared to its raw counterpart. The process results in higher milling yields, better resistance from fungal attacks or pests and distinct cooked structure. Parboiling of millets is practiced more likely as one of the processing methods for value addition of millets, unlike in the case of rice, wherein parboiling is a traditional practice.

Parboiling processes contains three distinct steps:

1. Soaking the grains to an optimum level, either to a desired predetermined level or equilibrium moisture content
2. Subjecting the grains to either hydrothermal treatment using steam or dry heat treatment using sand roasting or microwave heating or Ohmic heating; and
3. Drying the treated grains.

Parboiling imparts significant changes in the physical and functional properties of millets, the content of nutrients change depending on steeping and steaming conditions. When

the grains are steeped at higher temperatures, the water soluble nutrients may leach out resulting in the reduction of their total contents (Mannuramath and Yenagi, 2015). Moreover, steaming at elevated pressure and temperatures or dry heat treatment at higher temperatures may result in the breakdown of the nutrients like protein and fat and lead to the reduction in their contents after parboiling (Dharmaraj and Malleshi, 2011).

Parboiling induces significant changes in the physical properties of the millets. The color of grains turns to amber, the hardness increases and the cooking time increases, grain elongation also occurs as a result of parboiling (Visvanathan and Balkrishna, 2024). The extent of these changes is directly proportional to severity of the parboiling, namely, the time, temperature and pressure. The soaking conditions also directly influence the properties of parboiled millets. The extent of physical changes is higher for the millets soaked at higher temperature, than that of the grains soaked at ambient temperature. The effect of steaming conditions on the grains may be controlled by optimizing the moisture content of the steeped grains below equilibrium level.

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Generally, the millets are soaked to their equilibrium moisture content and then subjected to different degree of parboiling.

Generally, parboiling for minor millets, namely, Foxtail, Little, Proso, Kodo, Barnyard and Browntop millet is carried out to improve their dehushing efficiency (Akhil et al, 2021; Mannuramath and Yenagi, 2015). Hence, steeping the grains to an optimum moisture content and steaming at atmospheric pressure for 10 to 20 min, or subjecting to dry heat treatments like microwave or ohmic heating at mild conditions, will be desirable to improve the dehushing efficiency (Kabui and Athmaselvi, 2024). It has been observed that, in case of minor millets which contain a non-edible husk as part of the grain component, steaming facilitates opening of the husk such that its removal becomes easier. Moreover, steaming also imparts hardness to the grains, thus, steamed millet can withstand the impact during dehushing and result in low

breakage, improving the milling yield (Mannuramath and Yenagi, 2015). However, the major millets namely, sorghum, pearl millet and finger millet

contain a naked caryopsis. Parboiling sorghum and pearl millet hardens the endosperm and facilitates polishing (Young et. al., 1990). Higher degree of polishing decreases the nutrient contents significantly, hence, subjecting these grains to extreme conditions of parboiling, may not be industrially applicable. However, finger millet contains a seed coat rigidly attached the soft endosperm and polishing is impossible unless the grains are subjected to hydrothermal treatment (Shobana and Malleshi, 2007). The hardness of the finger millet increases by 5 to 6 fold than that of the control millet during steaming such that, the seed coat can be scraped off from the kernel to prepare decorticated finger millet (Dharmaraj et al., 2014).

Starch, a major nutrient in millets, undergoes significant changes during parboiling of millets. The starch granules dis-integrates leading to gelatinization that results in

a compact and homogenized structure. Covering up of the pores and fissures, present in the grain, also happens during this stage, thus, strengthening the hardness of the grain. As a result of parboiling, a significant reduction in the crystallinity of starch and in the viscosity parameters is observed (Young et al., 1993). A shift in the gelatinization temperature of the millet to higher degree is seen, and an increase in the total amylose content observed after parboiling (Young et. al., 1993). The properties of starch changes leading to higher water uptake, reduced solubility and higher swelling power (Rao et al 2026). A decrease in soluble fractions of non-starch polysaccharides is reported for finger millet (Dharmaraj and Malleshi 2011).

Millets are rich source of polyunsaturated fatty acids, except for finger millet, which contains more monounsaturated fatty acids. Hence, the conditions of parboiling need to be carefully optimized to control the reduction of these unsaturated fatty acids. Apart from reduction in the total fat contents of the grains, the unsaturated fatty acid contents decrease and a concurrent increase in the saturated fatty acids is observed as a result of parboiling.

The total protein content reduces as a result of steeping and formation of complexes with sugars during steaming, a noticeable change in the protein fractions is also reported for finger millet after parboiling by Dharmaraj and Malleshi (2011). However, heat treatment results in increased protein

digestibility. Due to the elevated temperature conditions during parboiling, enzymes like lipases are inactivated resulting in improved shelf-life of millets. It may be inferred that parboiling alters the nutrient profile rather than the total content.

Parboiling significantly changes the physical and

functional properties of the millets. These changes are directly proportional to the severity of the parboiling/steaming conditions. A few of the studies on effect of parboiling on the quality characteristics of different millets are summarized in the Table 1.

Table 1. Effect of parboiling on the milling and quality characteristics of millets

Type of Millet	Parboiling conditions	Changes in the quality parameters	Reference
Sorghum	Steep till EMC and steam for 10 min Steam for 10 min, steep and steam again for 10 min	Improved milling yield by 1.2-2-fold, attenuated starch crystallinity and change from A to V pattern, reduced viscosity and increased gelatinization temperature by 3 to 4°C	Young et al, 1990 Young et al, 1993
Sorghum	Steep till EMC and steam for 10 min at 100°C	Increase in water absorption index by 14% and 24% decrease in solubility at 50°C, and improvement in the shelf-life	Rao et al, 2026
Pearl millet	Steep till EMC and steam for 30 min at atmospheric pressure	Increase in hardness to 235 N, reduction in crystallinity, improvement in milling yield to 73%	Rathore and Singh, 2017
Pearl millet	Varying time and temperature of steeping, varying steam time	Increase in water absorption capacity from 2.71 to 3.33 g/g, increase in water solubility index to 6.16%. About 20% increase in the emulsion capacity	Prashanth et al., 2024
Pearl millet	Steeping at 50, 60 and 70°C and steaming	Reduction in phytate contents by 39%	Sene et al., 2018
Pearl millet and proso millet	Steep till EMC and boiling for 5 min	Improvement in milling yield by 37% for pearl millet and 28% for proso millet. Reduction in total starch from 80.1 to 71.7 g/100g for pearl and 81.4 to 77.2 g/100g for proso millet. Decrease in rapidly digestible starch for pearl and proso millet products from 18.2–19.1% to 17.4–18.3%. Increase in the resistant starch for pearl and proso millet products by 12.3–17.8% and 4.5–4.7%.	Bora et al., 2019
Finger millet	Steep till EMC and steam at atmospheric pressure for 30 min	Degradation of starch, increase in total amylose content from 16.7 to 19.1 g/100g, decrease in soluble amylose from 1.4 to 0.9 g/100g, Increased carbohydrate and protein digestibility by 12%. Alterations in the protein, fat and non-starchy polysaccharide profiles.	Dharmaraj and Malleshi, 2011 Dharmaraj et al., 2014

Type of Millet	Parboiling conditions	Changes in the quality parameters	Reference
Finger millet	Steep till EMC and steam at atmospheric pressure for 30 min	Increase in the hardness by 6.35 folds, decrease in sphericity from 0.93 to 0.89, 1000 kernel weight from 3.5 to 3 g, and viscosity from 1717 to 350 cPs. Increase in gelatinization temperature from 72.7 to 81.0, loss in structural integrity of the starch granules, loss in crystallinity	Dharmaraj et al., 2015
Finger millet and Foxtail millet	Steep till EMC and steaming for varying duration from 10 to 30 min	Increase in cooking time from 6 to 13 min for finger millet, and from 6 to 15 min for foxtail millet. Increase in water uptake from 2.2 to 3.7 g/g for finger millet and, from 3.4 to 4 g/g for foxtail millet. Increase in swelling index from 1.21 to 2.27 for finger millet and from 1.13 to 2.75 for foxtail millet.	Visvanathan and Balkrishna, 2021
Foxtail millet	Steep and steam for varying time and temperature	Reduction in total phenolics with increase in severity of steaming from 40.81 to 45.45 mg GAE/100 g, increase in antioxidant activity from 51.48 to 56.12% and 60.79 to 70.11%, depending upon the method followed, decrease in viscosity parameters	Kaur et al., 2024
Foxtail millet	Steep and steam	Improved milling efficiency, improved shelf-life, increase in water uptake	Kaur et al., 2024
Foxtail millet	Steeping for 5 h and steaming for varying duration	Increase in the grain diameters from 2.66, 1.30 and 1.32 mm to 2.68, 1.41 and 1.5 mm. Increase in water uptake from 25.75 to 74.7%. Increase in cooking time from 13 to 15 min. Improved dehulling efficiency	Akhil et al, 2021
Little millet	Steeping and steaming for varying time and temperatures	Improvement in milling efficiency, increase in cooking time to 28.73 min depending upon the severity of the parboiling conditions. Decrease in water uptake with the increase in severity of steaming conditions	Mannuramath and Yenagi, 2015
Proso millet	Steeping in at 60°C for 2 h and steaming for 10 min	Decrease in tannins from 0.282 to 0.197 mg/TAE, phytic acid from 3.124 to 2.126 mg/g, total polyphenols from 2.551 to 1.753 mgGAE/g, increase in water absorption capacity from 1.28 to 1.52 g/ml and oil absorption capacity from 1.6 to 1.73g/ml	Javed et al., 2025
Kodo millet	Steeping for varying time and temperature and steaming for 20 min, and subjected to ohmic heating for 20 min	Increase in dehulling efficiency from 85.17 to 91.67 for conventional parboiling and from 85.17 to 94.43 for ohmic parboiling. Ohmic parboiling produced harder grains than the conventional steaming method.	Kabui and Athmaselvi, 2024
Kodo millet, little millet & barnyard millet	Steep at 60 C for 3 h and steaming for varying time	Reduction in nutrients depending upon the steeping and steaming conditions	Iralepatil et al., 2024

Parboiling of millets is a processing method wherein the milling efficiency is improved concomitant with decreased antinutrients. Depending on the conditions of parboiling, the sensory characteristics, like color and texture, are affected. Thus, it is essential to optimize the processing parameters such as temperature and duration of steeping, duration and temperature of steaming or dry heat methods, and also the drying conditions of the millets, depending on the end uses of the specific millets.



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How **Safe** Are Our **Food** **Preservatives?**

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Why does a freshly prepared fruit juice spoil within days, while a packaged juice can remain safe for months?

While processing and packaging play an important role, preservatives are often an essential part of ensuring that many foods remain safe, stable, and of good quality throughout their shelf life. But before these preservatives ever reach our food, they undergo years of rigorous scientific evaluation to ensure they are both effective and safe for consumption. The FSS (Food Product Standards and Food Additives) Regulations, 2011 defines preservative as “a substance which, when added to food, is capable of inhibiting, retarding or arresting the process of fermentation, acidification or other decomposition of food”. They are classified into Class I and Class II preservatives (1).

Class I preservatives are substances derived from natural sources that have been used in food preservation for centuries in many cases, for thousands of years. According to FSSAI guidelines, Class I preservatives include common salt, sugar, dextrose, glucose, spices, vinegar, etc. Class II preservatives, because of their chemical nature and higher potency, are strictly regulated. Food safety authorities specify exactly

which Class II preservatives can be used, in which foods, and at what maximum concentrations. The most common Class II preservatives are benzoic acid, sulphites, sorbates, nitrites, etc (2).

How is the safety of these preservatives ensured?

The safety of any food preservative is established through a science-based process known as risk analysis.



It is a systematic and transparent approach used by regulatory authorities to evaluate the safety of food additives and make informed decisions regarding their use. It consists of three components: risk assessment, risk management, and risk communication.

The first step of risk assessment scientifically evaluates whether a preservative is safe for its intended use. Experts review the available scientific evidence to determine whether the preservative has the potential to cause adverse health effects. Initially, safety is evaluated through laboratory studies in animals to understand how the preservative is absorbed, distributed, metabolized, and excreted by the body, as well as to identify any harmful effects following short- and long-term exposure. Studies assess acute, sub-chronic and chronic toxicity, reproductive and developmental toxicity, genotoxicity and, where necessary, carcinogenicity.

The next stage establishes the relationship between the dose of the preservative and the observed effects. Since animal studies cannot be directly

extrapolated to humans, scientists identify the No Observed Adverse Effect Level (NOAEL) from toxicological studies, the highest tested dose in a study that did not cause a harmful or adverse effect and divide it by 100 to set the safe limit. The Margin of Exposure (MOE) is a tool used by risk assessors to determine the safety of substances found in food or the environment. It is a ratio that compares a known toxic dose to the amount that humans actually consume. MOE is calculated as the ratio of NOAEL to estimated human intake. This forms the basis for establishing the Acceptable Daily Intake (ADI), which represents the amount of a preservative that can be consumed every day over a lifetime without appreciable health risk. ADI is expressed in milligrams of substance per kilogram of body weight per day (mg/kg bw/day). However, establishing the ADI does not automatically determine where a preservative can be used. The third step estimates how much of the preservative consumers are likely to ingest through their

diet.

Regulatory authorities evaluate technological need, food consumption patterns and cumulative dietary exposure before prescribing maximum permitted levels for different food categories. For example, if a preservative is proposed for use in beverages, confectionery, bakery products and sauces, regulators estimate the total intake from all these sources. The combined dietary exposure should remain below the ADI for consumers. If the estimated intake approaches or exceeds the ADI, the maximum permitted levels may be reduced, or the preservative may be restricted to selected food categories. This ensures that preservatives remain effective in preserving food while continuing to protect consumer health (3,4).

At the international level, the Joint FAO/WHO Expert Committee on Food Additives (JECFA) conducts risk assessment, while the Codex Alimentarius Commission (CAC) manages risk and sets international standards for Member States. In the European Union, the European Food Safety Authority (EFSA) performs risk assessment for the European Commission (EC), which develops food additive legislation for member states.



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In India, the Food Safety and Standards Authority of India (FSSAI) oversees risk assessment and management through its Risk Assessment Cell and scientific panels, forming the basis for national regulations.

Efficacy Testing

A preservative is not approved based on safety alone; it must effectively inhibit the growth of spoilage and pathogenic microorganisms throughout the product's intended shelf life. To test this, laboratories conduct microbial challenge tests, where specific microorganisms are added to the product, and their growth is monitored during storage. These tests help confirm if the preservative can keep the product safe over time. Additional tests, like minimum inhibitory concentration (MIC), identify the lowest effective amount of preservative needed, while shelf-life studies ensure the product remains stable and of good quality during storage. The results help establish the minimum effective concentration required to

ensure product safety and stability without exceeding the permitted limits (5).

Only preservatives that demonstrate both safety and effectiveness under their intended conditions of use are approved for use in foods.

Sorbic acid and sorbates

Sorbic acid is an unsaturated fatty acid used as a food preservative, while potassium sorbate is its potassium salt, produced by neutralizing sorbic acid with potassium hydroxide. It is much more water-soluble than sorbic acid, making it easier to incorporate into aqueous food products. Sorbates can be used in beverages (fruit juices, wine and cider), bakery products, cheeses, fruits and vegetables pickled or candied, olives, jams and jellies, nuts, margarine, chewing gum, flavoured dairy products, prepared salads, sweets and syrups. Both preservatives are effective primarily against moulds and yeasts, and to a lesser extent against bacteria, by interfering with microbial enzyme systems and inhibiting growth. Their preservative activity is greatest in acidic foods (typically below pH 6). When added to food, potassium sorbate dissociates into potassium ions and sorbate. Thus, both

preservatives exert their antimicrobial effect through the same active compound, i.e. sorbic acid (6).

When it enters the human digestive system, potassium or calcium ions mix directly with your body's normal mineral levels and are used or excreted in urine. The sorbic acid part is almost fully absorbed by your small intestine and sent straight to the liver. The liver treats sorbic acid just like a natural fatty acid. It breaks down the carbon chains step by step. This turns the substance into simple carbon dioxide (CO₂) and water (H₂O) (7).

Benzoic acid, benzoates

Benzoic acid and sodium benzoate are used as preservatives in beverages, fruit and vegetable pickled products, baked goods, and condiments, etc preferably in a pH range below 4.5. The antimicrobial action of benzoic acid is mainly on yeast and fungi and, to a lesser extent, on bacteria. Following oral ingestion, benzoic acid and sodium benzoate are rapidly absorbed and metabolized in the liver and excreted in the urine. EFSA re-evaluated benzoic acid and its salts (sodium, potassium, and calcium benzoate) and concluded that they are rapidly absorbed after oral ingestion and exhibit low toxicity.

The Panel found no evidence of genotoxicity or carcinogenicity and identified a NOAEL of 500 mg/kg body weight/day from a four-generation reproductive toxicity study in rats. JECFA (2021) established a group ADI of 0–20 mg/kg body weight/day, replacing the previous ADI of 0–5 mg/kg body weight/day. The Committee also concluded that current dietary exposure, including the highest estimated intake in children, remains below this revised ADI, supporting the safety of benzoates when used within permitted levels (8).

Sulphur dioxide and sulphites

Sulphur dioxide and sulphites are widely used as food preservatives because they inhibit the growth of yeasts, moulds, and bacteria, particularly in acidic foods ($\text{pH} < 3$). In addition to their antimicrobial activity, they also function as antioxidants. They are commonly used in wine, dried fruits, fruit juices, jams, seafood, baked products, and certain beverages.

At approved levels, sulphur dioxide and sulphites are quickly metabolised and excreted safely, but they can degrade vitamin B1 (thiamine) and provoke allergic reactions in

sensitive individuals. Major dietary sources include wine and beer for adults, fruit juices for children, and dried fruits for infants. Whereas JECFA has set an ADI of 0–0.7 mg/kg body weight/day (9). The exposure to sulphur dioxide-sulphites (E 220–228) is expressed in mg SO₂ equivalents/kg body wt per day.

Sulphur dioxide– sulphites (E 220–228) were re-evaluated in 2016, resulting in the setting of a temporary ADI of 0.7 mg SO₂ equivalents/kg body wt per day. In 2022, based on the data available, the EFSA Panel reviewed the ADI and recommended revisions of the existing EU specifications for sulphur dioxide-sulphites (E 220–228). EFSA withdrew the previous temporary ADI of 0.7 mg/kg body weight per day, replacing it with a margin of exposure (MOE) approach. EFSA set a target MOE of at least 80. An MOE below 80 means potential health concerns (such as allergic or asthmatic reactions) cannot be ruled out for high consumers. Further Sulphur dioxide can be corrosive towards metals, especially if it picks-up moisture and oxygen from the



atmosphere as this can form traces of sulfuric acid. Therefore, limits for heavy metals have been specified as Arsenic (3mg/Kg), Lead (2mg/Kg), Mercury (1 mg/Kg).

Nitrites and nitrates

Sodium and potassium nitrites and nitrates are widely used in processed meats such as ham, bacon, sausages, and bologna as preservatives and colour fixatives. They help develop the characteristic cured meat colour and, most importantly, inhibit the growth of *Clostridium botulinum*. Although these compounds also occur naturally, their use in foods is strictly regulated to ensure they are effective while minimizing potential health risks.

In humans, nitrite and nitrate from food are rapidly absorbed by the body and, for the most part, excreted as nitrate. Some of the nitrate absorbed by the body is recirculated through salivary glands and part of it is converted by mouth bacteria into nitrite.



within the prescribed limits, approved food preservatives play a vital role in preventing spoilage, reducing foodborne illness, minimizing food waste, and maintaining food

quality without posing a risk to consumer health.

Ultimately, it is not the presence of a preservative that determines its safety, but the level at which it is consumed and regulated that determines its safety.

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The Acceptable Daily Intake (ADI) for inorganic nitrate is set at 3.7 mg per kilogram of body weight per day (mg/kg bw/day) expressed as the nitrate ion. Nitrites have a much lower ADI (0 to 0.07 mg/kg body weight/day for nitrite ion) due to a higher risk of acute toxicity like methemoglobinemia (10). Managing the risks of nitrates involves controlling exposure from contaminated drinking water, processed foods, and agricultural runoff.

Conclusion

Food preservatives are often viewed with suspicion because of their unfamiliar chemical names, but their safety is established through rigorous scientific evaluation rather than perception. When used



Iron Fortification Through Food: Making Every Milligram Count

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Iron, an essential element of various metabolic processes in our body. It plays critical roles in oxygen and electron transport, cell division, differentiation, and regulation of gene expression. The adult human body contains approximately 3–4 g of iron; 70% of it binds to haemoglobin, the pigment of red blood cells (RBCs) that gives the blood its red colour, and the rest binds to other proteins, such as myoglobin, transferrin, and ferritin, or is stored in the cells (1).

Iron deficiency is common and a major public health concern, particularly in countries where diets are

predominantly cereal-based. As per the WHO, iron deficiency is the leading cause of anaemia, affecting children, adolescents, women of reproductive age, and pregnant women. It affects physical growth, cognitive development, work productivity, pregnancy outcomes, and overall quality of life.

One major factor contributing to iron deficiency is that adequate iron intake does not guarantee optimal iron absorption. The quantity of iron absorbed from food depends not only on the amount of iron present but also on its chemical form, the food's overall composition, processing conditions, and the

presence of substances that inhibit or enhance absorption.

In many Asian countries, staples such as cereals and legumes contain phytates, which makes much of the iron consumed unavailable for absorption. In this context, food fortification becomes an essential public health intervention. The goal of iron fortification is to select an appropriate iron compound and food composition that together provide sufficient bioavailable iron without negatively affecting other nutritional factors.





Iron in the diet:

The average daily dietary iron intake in humans is 10 to 20 mg, out of which only 5 to 15% is absorbed through the intestinal tract (2). Nutrient-nutrient interactions, dietary inhibitors, and enhancers mainly influence iron bioavailability. Iron balance is mainly controlled by intestinal absorption because iron does not have active excretory mechanisms in humans (3).

There are two types of absorbable dietary iron: **Heme iron**, derived from haemoglobin and myoglobin of animal food sources (red meat, seafood, poultry), is the most easily absorbable form. **Non-heme iron** is

derived from plant-based foods like grains, millets, rice, pulses, and iron-fortified foods.

Absorption of Iron

depends on its form: The uptake of ferrous (Fe²⁺) iron is more efficient than ferric (Fe³⁺). Nonheme iron in food is mostly in the ferric state, which isn't easily absorbed. It needs to be converted to the soluble ferrous form in the stomach for better absorption in the small intestine.

Red meat is the most significant source of heme iron, which is highly bioavailable. Since 30–70% of the iron in meat is heme, the iron requirement for humans is mainly met by red meat in countries where it is a major part of the diet. In contrast, in countries where non-vegetarian food is not very common, iron intake depends on plant-based diets that contain

mostly non-heme iron, often less absorbed (1).

Diet composition is a key factor in non-heme iron absorption, as other dietary components can enhance or inhibit it. This makes non-heme iron the central concern in the formulation of fortified cereal, pulse and plant-based foods.

Inhibitors of Iron absorption:

Iron absorption is hindered by certain compounds in our diets, particularly those found in cereals and pulses. Phytates, the most potent inhibitors, are present in foods like cereals, millets, beans, and seeds. They bind with minerals such as iron, zinc, and calcium, forming insoluble complexes that are difficult to digest.

Calcium, when consumed in high amounts, can also inhibit both non-haem and haem iron absorption.

Common iron forms/salts:(11,12,13)

Iron form	Bioavailability	Fractional absorption	% of iron affected by phytate
Heme iron	High	15-35%	Completely unaffected
Non-heme iron	Low	2-10%	50% to 90%
Ferric pyrophosphate	Low	1% to 11%	50% to over 90%
Ferrous sulphate	High	10-15% under normal conditions	Strongly inhibited
Ferrous fumarate	High	10-20% under normal conditions	Strongly inhibited
NaFeEDTA	Highest	Higher than others in inhibitory diets	Largely resistant

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VITAMINS

WITH
34 VITAL
NUTRIENTS

MADE WITH
MILK PROTEIN

SUPPORTS
**MEMORY
& CONCENTRATION***





To counter this, enhancers like Vitamin C are added (14). Oxalates, found in green leafy vegetables, also reduce iron absorption (4). Similarly, polyphenols and tannins in tea, coffee, and chocolate can significantly impact absorption; for example, coffee can reduce iron absorption from a meal by 39%, while tea can decrease it by 64% (5).

Strategies to reduce Inhibitory Effects:

We have been practising several techniques like soaking beans and pulses overnight before cooking. It can reduce phytate by leaching and by activating endogenous phytase, allowing them to break down phytic acid, but the effect is inconsistent. A study of whole maize, millet, rice, sorghum and several legumes found significant phytate reductions in several foods after 24-hour soaking; hence, it can be considered a better processing strategy (15).

Germination or sprouting activates endogenous enzymes and can further reduce phytate. Fermentation can be particularly effective

because the fall in pH promotes phytase activity and microbial phytases may contribute to phytate breakdown. Human and intervention studies

show that prolonged fermentation or deliberate phytase addition can improve iron absorption, but the effect varies with fermentation time, organism, pH and residual phytate. Reported phytate reductions in fermented cereal foods range from approximately 40% to more than 90% in different processing systems (16).

Milling and dehulling are also important because phytate is concentrated in the outer layers of many grains and seeds, especially barley. However, removing bran can also remove iron, zinc and other nutrients. The objective is therefore not simply maximum dehulling, but an appropriate balance between phytate reduction techniques.

Enhancers of Iron absorption:

Ascorbic acid or Vitamin C is the most potent enhancer. It increases the absorption of non-heme iron by acting as a reducing agent and helps convert ferric to ferrous iron, which is more readily absorbed. It can also form soluble complexes with iron and reduce its binding to other components. Several

studies have shown that ascorbic acid can resist the inhibitory effect of polyphenols, phytic acid, and sodium oxalate (6). It's found in citrus fruits, bell peppers, tomatoes, guava, etc. Using lemon juice with dal or having oranges with breakfast cereals can improve absorption.

However, there is no fixed percentage on how much vitamin C can increase iron absorption; it depends on the iron compound as well as the food composition. The ascorbic acid molar ratio is more useful for food formulation. It ranges between 2:1 and 4:1 (Ascorbic acid to iron) for iron fortification. For example, in one study involving a wheat-based infant cereal, adding ascorbic acid at a 4:1 molar ratio increased absorption of ferric pyrophosphate from 2.0% to 5.8%, while absorption of ferrous sulfate increased from 3.2% to 14.8% (7). But ascorbic acid is highly sensitive and unstable; hence, technical difficulties during the preparation and storage need to be addressed.

Apart from this, other organic acids like citric acid and malic acid can also help iron binding and make it soluble. It is particularly used in acidic beverages, sauces and fermented foods. However, evidence suggests that organic acids

other than ascorbic acid may need to be present at relatively high acid molar ratios to produce a nutritional benefit; that is why Vitamin C is preferred (10).

Iron Fortification:

It refers to the deliberate addition of iron to commonly consumed foods to prevent or correct nutrient deficiencies within a population. Wheat flour, rice, cereal products and other staple foods can serve as vehicles. Rice poses challenges as it is often consumed as a whole grain. Two main approaches are used: coating ordinary rice grains with micronutrients and extrusion, where fortified rice kernels are made from rice flour and blended with regular rice. In India, fortified rice programs use these fortified rice kernels (FRK) mixed with ordinary rice.

The appropriate fortificant depends on the food matrix, processing, storage, sensory constraints, phytate content and regulatory requirements.

Sodium iron EDTA (NaFeEDTA):

When one adds a fortificant like ferrous sulphate to food, it can interact with other substances in the food. A high iron content does not guarantee that the iron will be easily absorbed by the body. This means

that the same amount of fortificant will work differently in different kinds of food products. The WHO/FAO food-fortification guidance identifies NaFeEDTA as particularly helpful in cereal flours, as the EDTA helps protect the iron from these inhibitors.

NaFeEDTA is an effective iron source particularly in foods rich in phytate. EDTA is a strong chelating agent. In NaFeEDTA, iron is associated with EDTA, which helps protect the iron from interacting prematurely with inhibitors. During digestion, iron is released and absorbed through normal physiological mechanisms. This remains substantially more bioavailable than many conventional iron salts in cereal and legume-based meals.

It is a pale-yellow compound commonly used in grain flours, breakfast cereals, sauces, and more. Advantages over ferrous sulphate include higher bioavailability, stability, and no impact on food flavour, while also preventing oxidation (8). A review indicated that iron from NaFeEDTA is absorbed 7-8 times better than from

ferrous sulphate and can enhance zinc and copper absorption. However, its cost is higher than that of ferrous sulphate.

Another possible option is the use of other salts of EDTA (Na_2EDTA or CaNa_2EDTA) together with a soluble source of iron, such as ferrous sulphate. The combination is as effective as NaFeEDTA when the EDTA:Fe molar ratio is between 1:2 and 1:1. This approach is, however, only feasible with vehicles that are stored for short periods because ferrous sulphate can cause organoleptic changes (9).

Other Fortificants:

Ferrous sulfate is a popular, cost-effective iron supplement due to its high bioavailability, but it can cause oxidation and affect the taste and shelf life of products.

Ferrous fumarate offers good bioavailability with fewer sensory changes but at a higher cost, commonly used in cereals and infant foods.





Ferric pyrophosphate is stable and minimally affects taste but has low bioavailability in high-phytate foods, making it suitable for sensory-sensitive products.

Encapsulated iron improves stability and sensory quality by reducing interactions with food components, but it raises manufacturing costs.

In **conclusion**, iron deficiency should be addressed to improve public health, particularly in populations depending on cereal-based diets. Understanding the different forms of dietary iron and the factors influencing its absorption can help formulate better nutritional

strategies and interventions. Emphasizing food fortification, dietary diversification, and implementing techniques to reduce inhibitors can positively enhance iron bioavailability.

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Beyond the Wrapper: The New Era of Food Packaging Innovation

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Take a moment to think about the last food product you purchased. Chances are, you noticed its taste, freshness, or nutritional value but not the packaging that made it possible. Yet, behind every packet, pouch, bottle, or tray lies a world of innovation working silently to keep food safe and fresh. Today, food packaging has evolved far beyond being a simple protective layer. It has become a critical component of the food system, helping reduce food loss, extend shelf life, improve traceability, and support sustainability.

The packaging industry is evolving due to changing consumer expectations, technological

advancements, and environmental challenges. Innovations like biodegradable materials, recyclable designs, and intelligent packaging that monitors food quality are transforming how food is packaged and consumed. As the industry shifts towards sustainability, packaging is increasingly crucial for ensuring food quality, safety, and environmental responsibility.

Why Food Packaging Innovation Matters

Food packaging innovation is essential for balancing food safety, quality, convenience, and environmental sustainability. Traditional plastic packaging contributes to pollution, creating a need for sustainable alternatives. Modern innovations enhance shelf life and food safety by

incorporating sensors and antimicrobial agents, thereby helping reduce food waste. Developing biodegradable, compostable, and recycled materials further minimises landfill waste and reliance on primary resources.

Technologies like nanotechnology improve packaging durability while using less material, and blockchain enhances transparency in the food supply chain, ensuring product authenticity. Ultimately, food packaging innovation addresses critical global challenges by protecting food and the environment.



Combining sustainable materials with smart technologies supports a safer and more efficient food system while meeting consumer expectations.

Major Innovations in Food Packaging

Some of the major innovations in food packaging are mentioned below:

- **Sustainable Packaging** - Sustainable food packaging aims to protect food while minimising environmental impact. It prioritises safety, resource efficiency, and materials that can be recycled, reused, composted, or derived from renewable sources.

The goal is to reduce packaging waste, conserve resources, and lower carbon emissions, while also preventing food loss.

Current solutions include recyclable, biodegradable, compostable, bio-based, reusable, and refillable options. Innovations in lightweight designs, advanced recycling technologies, and clear sustainability labelling are enhancing the circularity of the food system.

- **Biodegradable and Compostable Packaging** - Biodegradable and compostable packaging is created from renewable, plant-based materials that naturally decompose, reducing long-lasting waste. Key materials include bagasse (sugarcane fibre), bamboo, cornstarch, cellulose, and other biopolymers.

Cellulose is popular in food packaging due to its biodegradability and excellent oxygen barrier, though its moisture absorption limits its effectiveness. To enhance water resistance, it is often treated with hydrophobic coatings or additives. Chitosan, derived from crustacean shells, boasts antimicrobial properties and forms flexible films that help extend the shelf life of perishable foods.

Recent studies indicate that chitosan-based edible films with natural antimicrobials can effectively preserve food freshness. Starch, from sources like corn and potatoes, is also widely used for its abundance and versatility. Biodegradable packaging breaks down through microorganisms, while compostable packaging decomposes into nutrient-rich compost under specific conditions.

These options provide a sustainable alternative to

conventional plastics, reducing landfill waste and supporting better waste management.

- **Edible Packaging** - Edible packaging is a sustainable solution made from food-grade materials like seaweed extracts, cellulose, proteins and starch, designed to be consumed along with food, thus eliminating waste.

It's being explored for snack wrappers, condiment sachets, and single-serve items. By merging functionality with sustainability, it reduces plastic waste while enhancing the consumer experience.

Edible coatings provide a protective layer on fresh produce, extending shelf life and maintaining quality. Some common examples of edible packaging include edible straws made from sugar or starch, edible coffee cups that retain the original taste of beverages, edible spoons made from wheat or sorghum, cupcake wrappers produced from potato starch, and candy wrappers made from rice paper.

Edible film and coating materials must be chosen for food packaging purposes according to specific food applications, the types of food products, etc.



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Edible films and coatings function as barriers against oils, gases, or vapours and as carriers of active substances, such as antioxidants, antimicrobials, colouring, and flavours.

• **Recyclable and Reusable Packaging** - Recyclable packaging is manufactured using materials that can be collected, processed, and transformed into new products after use. Common examples include paper and paperboard, glass bottles, aluminium cans, steel containers, and recyclable plastics. Recycling helps conserve natural resources, reduces energy consumption, and minimises the amount of waste sent to landfills.

Reusable packaging is designed to withstand repeated use before being recycled or disposed of, reducing the need for single-use packaging materials. Examples include glass jars, stainless steel bottles, durable plastic containers, and reusable shopping bags. By extending the life of packaging, reusable systems help conserve raw materials, lower waste generation, and reduce the environmental

footprint

• **Active Packaging** - It is an advanced food packaging system that interacts with food and its environment to extend shelf life, maintain quality, and enhance safety by controlling factors like oxygen, moisture, and microbial growth. Key technologies include oxygen scavengers, moisture absorbers, and carbon dioxide regulators, which slow deterioration and reduce spoilage. Recent innovations integrate these components into biodegradable polymers and edible films, improving functionality and sustainability.

Concerns over synthetic antioxidants, such as BHT, have led to a shift towards natural alternatives like essential oils and plant extracts, which provide safer antioxidant properties. Edible films enriched with these bioactive compounds reduce oxidative damage and inhibit microbial growth, making them ideal for perishable foods. Additionally, advancements have led to stimuli-responsive polymers that release active compounds in

response to environmental changes, enhancing food quality and safety.

• **Modified Atmosphere Packaging** - Modified Atmosphere Packaging (MAP) is a food preservation technology that replaces the air in a package with a controlled mixture of gases, primarily CO₂, N₂, and O₂, to slow spoilage and extend shelf life without chemical preservatives. The gas composition is tailored to specific foods based on their respiration rates and preservation needs. CO₂ inhibits the growth of bacteria and moulds, while nitrogen serves as a filler to displace oxygen, preventing package collapse and protecting oxygen-sensitive foods. MAP can be applied through active methods, where the gas mixture is flushed in during sealing, or passive methods, relying on natural gas interaction. It's widely used for fruits, vegetables, meats, dairy, and ready-to-eat meals.

The effectiveness of MAP depends on the gas composition and high-barrier packaging to minimise gas and moisture transmission. When coupled with refrigeration, MAP extends shelf life, preserves food quality, and reduces waste, but requires careful optimisation of gas mixtures, packaging quality, and sealing for safety and performance.

Aseptic Packaging -

Aseptic packaging is a food preservation technology that involves filling a product into a pre-sterilised container, which is then hermetically sealed in a sterile environment to prevent microbial contamination. This process often uses ultra-high-temperature (UHT) treatment, heating the product before packaging, allowing for shelf-stable foods without refrigeration. The technology includes sterilisation of the food, packaging materials, and the filling process, utilising multilayer laminates made of paperboard, plastic, and aluminium foil for their barrier properties against moisture, oxygen, and light. Sterilisation methods include heat, hydrogen peroxide, UV light, and gamma radiation.

Aseptic packaging offers benefits like improved food safety, extended shelf life without preservatives, enhanced retention of nutrients and flavour, reduced storage costs by avoiding the cold chain, and a lighter environmental footprint. It's commonly used for milk, juices, soups, sauces, and other beverages, with formats including cartons, bottles, jars, and pouches.

Nanotechnology in Packaging -

Nanotechnology is an emerging field that



enhances food quality, safety, and shelf life by improving the mechanical strength, barrier performance, and antimicrobial properties of packaging materials. It also supports the development of smart and active packaging systems capable of detecting pathogens and monitoring food quality. One of its early commercial applications includes the use of nano-thin aluminium coatings in snack food packaging.

Among various nanomaterials, nanocomposites are the most widely used in food packaging due to their superior strength, heat resistance, and excellent barriers against oxygen, carbon dioxide, and moisture. Commonly produced by incorporating nanoclays into polymers like polyethylene, nylon, PVC, and starch, these materials reduce gas and moisture transmission, thereby extending the shelf life of fresh foods and beverages. Examples include nanocomposite-coated plastic films and beer

bottles, which offer improved durability and can significantly increase product shelf life while reducing packaging weight and transportation costs.

Challenges and Future Trends

Despite progress, challenges still hinder the adoption of innovative food packaging technologies. Advanced solutions like smart, active, and biodegradable materials tend to be more expensive, limiting access for small to medium-sized enterprises. Regulatory approvals for nanomaterials and active systems are complicated, and recycling multilayer packaging poses significant difficulties, hindering a circular economy.

The future of food packaging aims to create intelligent, sustainable solutions that enhance safety and reduce environmental impact. AI is enhancing material development and shelf-life predictions, while smart technologies like IoT and QR codes enable real-time monitoring of freshness.



The shift to biodegradable materials, such as cellulose and agricultural by-products, is growing. Innovations in nanotechnology and reusable systems are expected to improve barrier properties, extend shelf life, and reduce food waste, fostering a transparent and sustainable food supply chain.

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REGULATORY ROUND UP



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Dear Readers,

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

[Direction regarding Food Safety Standards \(Labelling and Display\) First, Amendment Regulations, 2025 related to labelling](#)

[requirements of Coffee- Chicory Mixture :](#)

FSS (L&D) First Amendment Regulations, 2025 related to labelling requirements of Coffee-Chicory mixtures to be implemented from 01.06.2026 are kept in abeyance in view of challenges in displaying proposed box declarations for the smaller packs. Food authorities now suggest an additional declaration on

the FOP, where only % of Coffee and Chicory to be mentioned. This will be implemented from 01.07.2027.

[Validity Order of FSSAI notified Food Testing laboratories as on 17th July 2026 :](#)

This order provides the latest list of FSSAI-approved laboratories with the validity of their accreditation as on 17.07.2026.

RESEARCH IN HEALTH & NUTRITION

Early Clinical Evidence Shows Probiotics Ease Geriatric Depression Symptoms

A pilot clinical trial published in the *Journal of the American Geriatrics Society* explored whether probiotics could serve as an adjunct therapy for depression in older adults.

The study involved 58 participants aged 60 or above with moderate depression who were already receiving standard care. Over 12 weeks, they were given either a daily dose of approximately 6 billion CFU of *Lactobacillus helveticus* and *Bifidobacterium longum* or a placebo. The probiotic group showed modest but meaningful reductions in depression and anxiety symptoms compared to placebo, though no significant improvement in overall quality

of life was observed. Researchers attributed this limitation to the small sample size and suggested that larger trials may reveal broader benefits.

Mechanistically, the study found elevated blood levels of brain-derived neurotrophic factor (BDNF) in the probiotic group, which supports the idea that probiotics may enhance brain health through the gut-brain axis. Gut microbiome analysis confirmed that the probiotic strains were successfully introduced and maintained in participants, ruling out placebo effects. While the findings are promising, the authors emphasized caution, particularly for immunocompromised patients, and recommended consulting healthcare providers before using probiotics for mental health.

The researchers highlighted that standard antidepressants often yield only about a 50% response rate in older adults, underscoring the need for adjunct therapies. They believe probiotics could be one such option, but larger, long-term studies are required to establish statistical certainty and determine whether quality-of-life improvements follow symptom relief. They also noted that benefits are strain-specific, meaning results cannot be generalized to all probiotics.

In the broader context of nutrition and depression, other supplements such as folic acid, lavender, zinc, tryptophan, rhodiola, and lemon balm have shown limited but promising evidence. Additionally, separate clinical trials have found psilocybin to produce sustained reductions in depression and anxiety in cancer patients, pointing to diverse avenues of research in nutritional and alternative approaches to mental health.

<https://www.nutritioninsight.com/news/probiotics-depression-anxiety-older-adults-gut-brain-axis-trial.html>

Ingredient Synergies: Yeast-Based Protein Boosts Whey Performance

Angel Yeast's recent research highlights how blending yeast protein with whey protein creates a synergistic nutritional effect that surpasses either source alone.

Whey protein is widely regarded as the gold standard for rapid absorption, but yeast protein contributes elevated levels of amino acids such as arginine, lysine, histidine, phenylalanine, and tyrosine. When combined, the blend improves the Amino Acid Score by up to 43% compared to whey isolate alone, supporting muscle protein synthesis while adding functional benefits from yeast's amino acid and micronutrient profile.

Yeast protein is produced through fermentation, making it hypoallergenic, lactose-free, and suitable for vegan and religious dietary restrictions. It achieves a Protein Digestibility-Corrected Amino Acid Score (PDCAAS) of 1.0, contains over 80% protein, and delivers 47% essential amino acids. The fermentation process also yields micronutrients such as B-complex vitamins, dietary fibre, iron, and zinc, which complement whey's calcium

and potassium content to form a mineral-rich “super-protein.” With negligible sugar and fat, blends can be tailored to meet keto or low-sugar claims. Angel Yeast recommends optimal ratios of 7:3 or 8:2 (yeast to whey) to maximize benefits.

Beyond nutrition, yeast protein offers supply chain stability compared to animal-derived proteins, as it is less affected

by agricultural volatility. It also provides inclusivity for individuals with lactose intolerance, milk protein allergies, or plant protein sensitivities. Angel Yeast emphasizes the principle of protein complementarity, where blending sources bridges amino acid gaps and enhances biological value, yielding superior growth and efficiency compared to single-source

proteins. While yeast protein is still an emerging category requiring consumer education, regulatory recognition is advancing, with approvals in the EU, Japan, and self-affirmed GRAS status in the US.

<https://www.nutritioninsight.com/news/angel-yeast-protein-angeopro-whey-isolate-amino-acid.html>

Whey Protein Isolate Byproducts Show Unexplored Value for Human Nutrition

The article explores the potential of whey protein phospholipid concentrate (WPPC), a coproduct generated during whey protein isolate production, as a functional ingredient for human nutrition.

Traditionally used in low-value animal feed, WPPC is rich in milk fat globule membrane components such as phospholipids, sphingolipids, glycoproteins, and bioactive proteins. Preclinical studies suggest it may benefit gut health, the microbiome, bone strength, cognitive function, and nutrient delivery, positioning it as more than just a protein byproduct.

Dr. Gulustan Ozturk of the University of Wisconsin-Madison emphasizes that WPPC represents a link between

sustainability and nutrition, offering a way to transform underutilized dairy coproducts into value-added functional foods. Its complex composition makes it challenging to fully characterize, but growing interest in milk fat globule membrane bioactives has spurred research into its potential role in healthy aging and precision nutrition. Target populations include postmenopausal women and older adults, who may benefit from WPPC's phospholipids, choline, and protein content. Possible applications range from ready-to-mix powders and dairy beverages to yogurts, protein-enriched snacks, and cheese-based products, leveraging WPPC's emulsifying properties.

For infant nutrition, WPPC faces stricter regulatory requirements, but the American Dairy Products Institute has already developed specifications for Infant Formula Grade WPPC. Globally, phospholipid-rich dairy ingredients are being

incorporated into infant formulas to better mimic the bioactive lipid profile of human milk, reflecting both scientific and commercial interest.

Ozturk stresses that advancing WPPC from animal feed to premium human nutrition requires detailed compositional characterization and robust human studies to demonstrate bioavailability, physiological relevance, and benefits in target populations. Marketing strategies should remain evidence-based, focusing on WPPC's naturally occurring phospholipids, nutrient density, and sustainability rather than exaggerated claims. As research expands, WPPC is increasingly seen as a versatile dairy ingredient with applications in healthy aging, gut health, cognitive support, and functional foods, signalling a shift in perception from overlooked byproduct to specialized nutrition resource.

<https://www.nutritioninsight.com/news/whey-protein-byproducts-human-nutrition.html>

Researchers Call for Recognizing Nutrition's Existing Role in One Health

The upcoming perspective article argues that nutrition is an overlooked but essential component of the One Health paradigm, which integrates human, animal, and ecosystem health.

The authors emphasize that dietitians already practice One Health principles through their work on sustainable diets, food insecurity, and chronic disease prevention, but rarely frame these efforts explicitly within the One Health model.

Dr. Diogo Sousa-Catita explains that the gap lies not in what dietitians do, but in recognizing their contributions as One Health in practice, which could strengthen interdisciplinary collaboration and elevate nutrition's visibility in global health strategies.

The article highlights that nutrition uniquely connects human health, food systems, and environmental sustainability. Dietitians operate across multiple levels—from clinical care to community programs and policy

advocacy—making their work inherently aligned with One Health objectives. Embedding One Health into nutrition education, fostering interprofessional collaboration, and developing evaluation frameworks that measure environmental and social outcomes alongside clinical ones are proposed as ways to make nutrition's role more explicit.

Sousa-Catita stresses that this reframing does not expand dietitians' scope of practice but acknowledges how far their role

already reaches. Advocating minimally processed, sustainable diets, addressing food insecurity, and supporting equitable food policies are all examples of existing contributions that advance One Health goals. By making these impacts visible, nutrition can be recognized as a vital piece of the One Health puzzle, complementing medicine, nursing, veterinary science, and environmental disciplines.

<https://www.nutritioninsight.com/news/nutrition-missing-link-one-health-dietitians-sustainability.html>

Cutting Sucrose from Low-Fat Diet May Disrupt Gut Microbiome

An important nuance in nutrition science: cutting sucrose from a low-fat diet in mice did not lead to weight loss but instead disrupted the gut microbiome, increased inflammation, and impaired glucose control.

Researchers found that the negative outcomes were likely due to replacing sucrose with starch, which shifted the overall carbohydrate composition rather than the absence of sugar alone.

Key findings include a drop in gut bacterial diversity, depletion of beneficial short-chain fatty acid (SCFA) producers like *Lactobacillus murinus* and *Ruminococcus*, and an increase in pro-inflammatory bacteria such as *Helicobacter ganmani* and *Alistipes*.

This imbalance was linked to colonic inflammation, goblet cell loss, immune-cell infiltration, and fatty liver changes. Despite these metabolic disruptions, body weight remained unchanged compared to controls.

The authors emphasize that balanced nutrition matters more than simply eliminating sugar. They argue that dietary strategies should consider how

carbohydrate composition supports beneficial gut bacteria and immune homeostasis. Future human trials are needed to determine whether similar effects occur in people, especially since sugar restriction is often recommended for metabolic health.

In essence, the research challenges the assumption that sugar reduction is always beneficial, suggesting that the broader nutrient context — particularly the balance of carbohydrates — plays a critical role in gut and metabolic health.

<https://www.nutritioninsight.com/news/sucrose-gut-health-metabolism-inflammation-sugar-diet.html>

Fiber-Derived Butyrate May Shape Immune Cell Development

The study from Tokyo University of Science highlights how fibre-derived butyrate, a short-chain fatty acid (SCFA) produced by gut bacteria fermenting dietary fibres like inulin and

pectin, plays a significant role in shaping immune cell development.

Researchers found that butyrate strongly promoted the maturation of dendritic cells — the “sentinels” of the immune system — by increasing the expression of specialized surface molecules that

coordinate innate and adaptive immunity. Compared to other SCFAs such as propionate, valerate, and acetate, butyrate had the most pronounced effect, enhancing proteins involved in immune-cell communication and boosting LPAM-1, a receptor that helps immune cells localize in the intestinal mucosa.

It also shifted the balance of dendritic cell types, favouring conventional dendritic cells over plasmacytoid ones, which suggests a more stable immune response.

The researchers linked these effects to epigenetic regulation, showing that butyrate influenced histone modifications and gene expression in bone marrow-derived dendritic cells. This

connection between dietary fibre, gut microbiota metabolites, and epigenetic pathways underscores how nutrition can directly shape immune system development.

While the findings are promising, the team cautions that further studies in human dendritic cells are needed to confirm whether these effects translate beyond mice. If

validated, this research could open new avenues for preventing or managing immune-related disorders such as allergies, inflammation, and autoimmune diseases by leveraging dietary fibre and microbiota-derived metabolites.

<https://www.nutritioninsight.com/news/study-fiber-butyrate-scfa-immunity.html>

US Researchers Develop Tool to Advance Probiotic Supplement Formulation and Effectiveness

The UVA study analysed 352 probiotic supplements sold in major US drugstore chains and found that most products contained very limited microbial diversity — over half had only one bacterial species, with just 36 unique species identified overall.

Many of these were *Lactobacillus* strains commonly found in yogurt. Researchers noted that product claims often didn't align with the actual microbial content, especially for gut and vaginal health.

To address this gap, they

developed **HaPaPro**, a computational tool that uses more than 1,000 metabolic models to identify beneficial microbes and guide more targeted probiotic formulations. Unlike traditional approaches that rely on empirical strain supplementation, HaPaPro focuses on functional, evidence-based ecological interventions. For example, the tool identified species capable of producing d-lactic acid to suppress *Gardnerella vaginalis*, a pathobiont linked to bacterial vaginosis. This shifts the focus from simple acidification to the accumulation of therapeutic metabolic byproducts.

The study also highlighted the regulatory landscape: while the US FDA has approved two microbial products for

therapeutic use (for *Clostridioides difficile* infections), most probiotic supplements remain under looser oversight compared to pharmaceuticals. The researchers argue that computational tools like HaPaPro could help expand the pool of beneficial bacteria and improve product effectiveness by distinguishing between metabolic capability and colonization potential.

Overall, the findings underscore both the promise and the limitations of current probiotic supplements — pointing toward a future where formulations are more diverse, targeted, and scientifically substantiated.

<https://www.nutritioninsight.com/news/us-probiotic-supplements-microbial-diversity-hapapro-uva-study.html>

Cow's Milk Linked to Better Bone Health and Nutrition Than Plant-Based Alternatives

The review from Edith Cowan University emphasizes that cow's milk has a unique "milk matrix" — a natural structure containing over 100 nutrients

and bioactive compounds — which enhances nutrient absorption, supports bone strength, and influences digestion, cholesterol, blood sugar, and the gut microbiome.

Researchers argue that this complex package of nutrients cannot be fully replicated by plant-based drinks or calcium supplements. Evidence cited in the paper shows that regular

milk consumption is linked to stronger bones and up to a 43% reduction in fracture risk, while calcium supplements sometimes carry risks, including higher rates of heart disease in older women.

Fermented dairy products appear to offer additional benefits due to bioactive compounds formed during fermentation.

The study highlights concerns about replacing dairy with plant-based alternatives in children's diets, noting that fortified plant-based drinks often lack the same nutrient bioavailability and may contain added sugars, oils, or stabilizers. Without careful planning, children who omit

dairy risk deficiencies in protein, calcium, iodine, and vitamin B12, which can lead to malnutrition, rickets, scurvy, goitre, and developmental delays. Researchers stress that milk remains one of the most accessible and effective whole foods for delivering essential nutrients. At the same time,

they acknowledge that plant-based diets overall can provide anti-inflammatory benefits compared to omnivorous diets, based on evidence from randomized controlled trials.

<https://www.nutritioninsight.com/news/cow-milk-dairy-plant-based-bone-health.html>

Precision-Fermented DHA Boosts Breast Milk Levels 26% In Trial

The article details a clinical trial showing that Mara Renewables' precision-fermented DHA oil, branded as Algorithm, increased breast milk DHA levels by 26% in breastfeeding mothers after ten weeks of supplementation.

The study, conducted with Ritual Essential Postnatal and co-funded by Ritual and Mara Renewables, involved 64 participants and was randomized, double-blind, and placebo-controlled. In addition to boosting DHA, higher breast milk DHA levels were associated with reduced blood cortisol, a biomarker of physiological stress, suggesting benefits for

maternal well-being alongside infant development.

Mara's microalgal oil is produced through precision fermentation using non-GMO strains in a controlled environment, followed by a patented solvent-free extraction process. This ensures purity, avoids marine contaminants, and delivers a fish-free, vegan, Halal, and Kosher-certified omega-3 source. The company emphasizes that its oil contains higher DHA concentrations than fish oil and avoids the fishy taste, improving consumer satisfaction and adherence. Sensory qualities such as taste and smell were highlighted as critical for compliance, particularly during the demanding postnatal period.

The trial underscores DHA's established role in infant brain

and eye development and maternal health, while pointing to the global issue of omega-3 insufficiency, with over 80% of people estimated to consume inadequate amounts. Mara Renewables positions its product as a sustainable solution that reduces reliance on marine resources and expands opportunities for applications in prenatal and postnatal supplements, infant nutrition, healthy aging, functional foods, and animal nutrition. The company sees growing demand for clean, high-quality, and environmentally responsible omega-3 sources, with microalgal DHA poised to play a central role in the health and nutrition industry.

<https://www.nutritioninsight.com/news/mara-renewables-algorithm-dha-breast-milk-postnatal.html>

International Review Challenges Protein Satiety, Quality and Weight Loss Assumptions

The international review published in Critical Reviews in Food Science and Nutrition reassesses widely held assumptions about protein's role in satiety, quality, and weight management.

The authors, a group of over 20 protein researchers, argue that protein is not consistently the most satiating macronutrient, noting that feelings of fullness do not always translate into reduced food intake. They emphasize that satiety depends on factors such as food source, eating occasion, and overall diet pattern, rather than protein alone. While higher-protein diets can modestly

increase fullness, the evidence does not firmly establish protein as uniquely satiating.

On protein quality, the paper highlights that animal-sourced proteins generally score higher on the digestible indispensable amino acid score (DIAAS) compared to plant-based proteins. However, the authors stress that amino acid composition, digestibility, and bioavailability are just as

important as total protein quantity. Individual amino acids such as leucine, methionine, threonine, and branched-chain amino acids play distinct roles in metabolic pathways, and current RDAs may underestimate true physiological needs beyond basic protein synthesis. Critics caution that overreliance on DIAAS may obscure the benefits of plant proteins, which also help address global fiber deficiencies.

Regarding weight loss, the review suggests that maintaining a steady protein intake is more beneficial than simply increasing intake.

Evidence shows that diets low in protein relative to fat and carbohydrates can drive higher calorie consumption, contributing to obesity. Older adults likely require higher protein intakes — around 1.2–1.6 g/kg/day — to preserve muscle mass and function. The authors also note that high protein intake does not appear harmful to healthy kidneys, with no adverse effects observed at levels up to 1.5 g/kg/day or 20% of energy intake.

The paper concludes that while protein is essential, its benefits are nuanced. It calls for larger,

longer randomized controlled trials with clinical endpoints, and more data on diverse populations, including children, adolescents, and individuals using GLP-1 receptor agonists for weight loss. Overall, the review challenges simplistic claims about protein's superiority, urging a more evidence-based approach that considers quality, distribution, and individual needs rather than assuming protein alone drives satiety or weight loss.

<https://www.nutritioninsight.com/news/protein-research-muscle-diet-amino-acid.html>

Review Links Early Life Diet to Intelligence and IQ In Adolescence

The review published in *Advances in Nutrition* synthesizes findings from 73 studies examining how diet in early life and adolescence influences intelligence and academic outcomes.

It highlights that poor diets in infancy and childhood are consistently linked to lower IQ and weaker cognitive performance in teenage years, underscoring early childhood as a critical window for brain development. Lead author Hayley Young notes that adolescence may represent a second opportunity to support brain health through nutrition, but evidence remains mixed and requires more rigorous study designs.

The analysis found that healthy dietary patterns — including

frequent fish consumption, Mediterranean-style diets, whole grains, dairy, and soft fats — were associated with higher IQ scores, larger brain volume, and better academic grades. Conversely, Western-style diets high in fried potatoes, red meat, and processed snacks were linked to poorer information processing and memory. Daily fast food consumption at ages 10–11 correlated with weaker math, literacy, and science performance by early adolescence. School breakfast programs showed modest improvements in arithmetic scores, though not in reading or writing.

Nutrient deficiencies emerged as a major concern. Eliminating deficiencies in iron, iodine, and zinc could raise global IQ averages by up to 10 points. Iron supplementation improved cognitive outcomes in adolescents with anemia but had no effect in those with adequate baseline levels. Iodine supplementation benefited non-verbal IQ in

cases of moderate to severe deficiency, though results varied. The review stresses that nutrition's impact depends on timing, population characteristics, and the specific cognitive abilities measured.

The findings also align with prior research showing that diets high in sugar and fat during childhood can alter brain regulation of eating, shaping food preferences into adulthood even if healthier diets are adopted later.

Healthy dietary patterns have additionally been linked to slower progression of chronic diseases in older adults and fewer depressive symptoms in teenagers. Overall, the review emphasizes that nutrition in the earliest years of life lays the foundation for cognitive health, with adolescence offering a potential but less certain opportunity to reinforce brain development through diet.

<https://www.nutritioninsight.com/news/early-life-diet-brain-development.html>



Vitamin K2 Slows Coronary Calcification in Clinical Trial

The two-year randomized, double-blind, placebo-controlled trial published in JAMA Cardiology demonstrates that vitamin K2 in the form of menaquinone-7 (MK-7), significantly slowed the progression of coronary artery calcification (CAC).

Among 180 patients with coronary artery disease, daily supplementation of 360 µg MK-7 reduced CAC progression by 29% compared to placebo, while calcium mass progression was cut by 42%. These findings are notable because CAC is a strong predictor of cardiovascular disease, and currently there are no effective treatments to

reverse or slow vascular calcification.

The mechanism involves activation of matrix Gla protein (MGP), a vitamin K-dependent inhibitor of arterial calcification. MK-7 supplementation improved vitamin K status outside the liver, increased blood MK-7 levels, and lowered un-carboxylated MGP, all supporting reduced calcification. The trial also showed benefits despite many participants being on statin therapy, which stabilizes plaques but can increase calcification scores, and despite high smoking rates among participants, which typically accelerate CAC progression.

The results add to nearly two decades of clinical research on

MenaQ7, which has previously demonstrated benefits for arterial elasticity and blood pressure regulation. Experts emphasize that MK-7 may represent a breakthrough in proactive heart health care, as CAC scoring reflects vascular age and cardiovascular risk. Gnosis by Lesaffre underscores that vitamin K2 deficiency is widespread, with estimates suggesting up to 97% of Western populations have insufficient levels, leaving them vulnerable to compromised heart and bone health. The Council for Responsible Nutrition has confirmed MK-7's safety at intake levels up to 375 µg daily, supporting its use as a safe and effective intervention for cardiovascular protection.

<https://www.nutritioninsight.com/news/gnosis-by-lesaffre-vitamin-k2-coronary-calcification.html>



Scientists Say Most People Need More Protein Than Current Guidelines Suggest

A new review from Lucy Cavendish College at the University of Cambridge argues that current public health guidelines for exercise and protein intake are set too low, focusing mainly on avoiding deficiency rather than maximizing long-term health and independence.

The paper, published in Frontiers in Nutrition, highlights that higher levels of physical activity and protein consumption may help people remain stronger, sharper, and more resilient as they age.

The author, Dr. Chris Macdonald, emphasizes that exercise should not be seen only as a way to prevent disease but as a tool to maintain strength, mobility, and independence across the lifespan.

Evidence shows that combining aerobic activities such as walking, running, or cycling with resistance training provides particularly powerful benefits, including lower mortality risk, improved mental health, and stronger cognitive function.

Protein intake is another area where current recommendations may fall short. UK guidelines are designed to prevent deficiency in sedentary adults, but newer research suggests that older adults, physically active

individuals, and pregnant women may benefit from significantly higher protein consumption. Higher-protein diets have also been linked to improved body composition, supporting fat loss through increased satiety and metabolic effects. Importantly, these benefits are not limited to meat-based diets, as plant-based diets can also provide sufficient protein with careful planning, as demonstrated by vegan athletes.

Dr. Macdonald calls for a shift from minimum health standards to optimal health outcomes. He argues that society should move away from associating high-protein diets and high-intensity exercise with superficial goals like bodybuilding aesthetics, and instead recognize their role in extending health span and independence.

His vision is of aging not as inevitable decline but as an opportunity to remain strong, mobile, and mentally sharp well into later life. He suggests that many of the frailties often

normalized in old age are actually consequences of sedentary lifestyles rather than unavoidable effects of aging, and that proactive changes in exercise and nutrition could

profoundly reduce unnecessary suffering.

<https://www.sciencedaily.com/releases/2026/06/260622091429.htm>

This Common Vitamin Deficiency Can Mimic Normal Aging

Vitamin B12, though required in only microscopic amounts, plays a crucial role in maintaining energy, nerve function, and red blood cell production.

Its importance was first recognized nearly a century ago when liver-rich diets were found to treat pernicious anemia, a condition caused by poor absorption of B12 rather than blood loss. This discovery eventually led to the isolation of vitamin B12 itself, a cobalt-containing compound essential for life.

Despite decades of research, deficiency remains common, especially among older adults, vegans, vegetarians, and those with absorption issues. Age-related changes such as reduced stomach acid,

autoimmune gastritis, or the use of certain medications for diabetes and acid reflux can impair absorption. Symptoms often develop gradually and may be mistaken for normal aging, including fatigue, weakness, shortness of breath, tingling in the extremities, balance problems, memory issues, and brain fog. Because these signs are nonspecific, persistent problems should be medically evaluated rather than assumed to be due to a simple vitamin shortage.

Traditionally, the fatigue associated with B12 deficiency has been linked to anemia, since the bone marrow produces large, immature red blood cells that carry oxygen less effectively. However, recent research suggests another mechanism: B12's role in mitochondrial function. One of the two enzymes that depend on B12 works inside mitochondria, the cell's energy producers. Studies in muscle cells and aged mice indicate that low B12 can impair

mitochondrial DNA and energy production, while supplementation may improve mitochondrial health. This could explain why some people feel exhausted before anemia is evident.

These findings highlight that B12 deficiency can mimic aging-related decline, but they do not suggest that supplements act as energy boosters in people with normal levels. Injections remain an established treatment for diagnosed deficiency, particularly when absorption is impaired, but there is little evidence they enhance energy or performance otherwise. The broader lesson is that even a vitamin needed in millionths of a gram can profoundly affect health, and its role in cellular energy may help explain why deficiency manifests as fatigue and cognitive changes long before traditional markers appear.

<https://www.sciencedaily.com/releases/2026/06/260623083116.htm>

Researchers Discover Why Fructose Doesn't Satisfy Hunger Like Glucose

The study from the Monell Chemical Senses Center reveals that fructose and glucose, though identical in calorie content, affect the brain in strikingly different ways.

In experiments with mice, glucose strongly suppressed the activity of AgRP neurons—cells in the hypothalamus that drive hunger—while fructose produced only a modest reduction. This difference stems from the distinct biological pathways each sugar uses to communicate with the brain.

Fructose increased levels of the gut hormone PYY, which

signalled through the vagus nerve to slightly dampen hunger neuron activity.

When this pathway was disrupted, fructose lost its effect entirely. Glucose, on the other hand, bypassed this mechanism and directly suppressed AgRP neurons much more effectively, leading to a stronger reduction in hunger signals.

The researchers also tested high-fructose corn syrup (HFCS), a mixture of fructose and glucose widely used in processed foods and drinks. Mice showed a preference for HFCS, which suppressed hunger neurons more strongly than fructose alone. This may help explain why HFCS-containing products are particularly appealing and why they can

influence food cravings beyond simple calorie counts.

These findings challenge the assumption that hunger-related neurons respond only to total calorie intake. Instead, the type of sugar matters: fructose and glucose are processed through separate gut-brain pathways, producing different effects on appetite and

preference. The work underscores the complexity of nutrient sensing and suggests that even simple sugars can shape eating behaviour in distinct ways, with implications for understanding modern diets and their impact on obesity and metabolic health.

<https://www.sciencedaily.com/releases/2026/06/260623083106.htm>



Scientists Discover a Surprising Link Between Vitamin C And Brain Health

A large-scale study from Japan has uncovered a notable association between vitamin C levels and brain health in older adults.

Researchers analysed MRI scans and blood samples from more than 2,000 participants over the age of 64 and found that those with lower plasma vitamin C levels tended to have smaller volumes of grey matter and weaker connectivity within the default mode network, a brain system crucial for memory, attention, and other cognitive functions.

The study, published in PLOS One, adds to earlier evidence suggesting that higher vitamin C intake may be linked to reduced risk of cognitive impairment. Unlike previous work that focused on dietary intake, this research directly measured vitamin C levels in the blood and connected them to structural and functional brain differences. Even after accounting for age, education, and physical activity, the association remained consistent.

While the findings do not prove that vitamin C directly protects the brain, they highlight the potential role of nutrition in supporting healthy cognitive aging. The researchers emphasize that this was an observational study, meaning causation cannot be

established. Future research will need to track vitamin C levels over time, consider broader lifestyle factors, and include diverse populations to better understand the mechanisms involved.

The results suggest that everyday dietary habits may influence brain structure and function, and maintaining adequate vitamin C levels could be one factor in preserving cognitive resilience. As one of the study's authors noted, the ability to detect subtle but significant associations between a single nutrient and large-scale brain networks underscores the importance of nutrition in shaping how the brain ages.

<https://www.sciencedaily.com/releases/2026/06/260626030428.htm>



Vitamin B12 And Folate Deficiencies Linked to Chronic Fatigue

Researchers at Osaka Metropolitan University have identified a link between deficiencies in vitamin B12 and folate and chronic fatigue, even among otherwise healthy individuals.

The study focused on homocysteine, a blood marker that rises when these vitamins are lacking. Elevated homocysteine levels were associated with greater fatigue in men and lower motivation in women, suggesting that inadequate intake of B12 and folate may quietly undermine energy and drive.

The research involved around 600 Japanese adults, whose

blood levels of homocysteine, folate, and vitamin B12 were measured alongside assessments of fatigue and motivation. The findings held true even after accounting for age, sleep, workload, and diet. Traditionally, high homocysteine has been linked to cardiovascular disease, dementia, and fractures, but this study highlights its potential role in everyday exhaustion.

Professor Hiroaki Kanouchi, who led the study, emphasized that maintaining a balanced diet is essential to prevent deficiencies that can raise homocysteine levels. While fatigue is often attributed to stress or poor sleep, these results suggest nutrition may

play a more significant role than previously recognized.

Published in *Nutrients*, the study represents one of the first reports connecting vitamin B12 and folate status directly to fatigue and motivation in

healthy adults, underscoring the importance of these vitamins not only for long-term health but also for daily energy and wellbeing.

<https://www.sciencedaily.com/releases/2026/05/260528082501.htm>

Novel Polyphenol-Based Ingredient Could Boost Distance Running



Researchers in Japan have found that a novel polyphenol-based ingredient derived from lychee fruit, known as Oligonol, may enhance endurance performance in long-distance runners.

Oligonol is a patented low-molecular-weight polyphenol developed by Amino Up Co. and distributed by Maypro for use in capsules, powders, beverages, and active nutrition products.

Unlike many dietary polyphenols that are poorly absorbed due to their high molecular weight, Oligonol contains oligomerized polyphenols that are more bioavailable, allowing the body to efficiently utilize their

antioxidant properties.

The study, published in the *Journal of Exercise and Nutrition*, was a randomized, double-blind, placebo-controlled trial involving 34 runners aged 45 to 64 who regularly ran at least 100 km per month.

Participants consumed either Oligonol capsules (200 mg/day) or a placebo over a 60-day period while maintaining their usual training routines.

Results showed that those taking Oligonol significantly increased their running distance during a 12-minute treadmill test by about 70 meters compared to placebo, and they reported a two-point reduction in perceived exertion scores.

The researchers concluded that Oligonol may support endurance performance by improving energy metabolism efficiency and reducing fatigue.

They also noted its fast-acting benefits, as previous studies have shown improved blood flow after a single dose. Industry experts highlighted that Oligonol represents a premium, clinically validated ingredient that goes beyond traditional sports nutrition staples like protein and caffeine, offering both scientific credibility and consumer appeal.

The findings reinforce the growing interest in polyphenols as functional supplements for athletes, particularly in addressing oxidative stress and inflammation, which are key contributors to fatigue and reduced performance.

The study provides evidence that Oligonol could be a valuable addition to endurance-focused nutrition strategies.

<https://www.nutraingredients.com/Article/2026/05/29/novel-polyphenol-based-ingredient-supports-distance-runners/>

Probiotic-Fermented Yogurt Improves Glucose Control, Gut Microbiota

impact of daily probiotic-fermented yogurt consumption on glucose control and gut microbiota in Japanese adults without diabetes.

The Meiji study explored the

Conducted over 84 days with

303 participants, the intervention involved consuming 200g of yogurt fermented with *Lactobacillus delbrueckii* subsp. *bulgaricus* 2038 and *Streptococcus thermophilus* 1131 each morning.



Continuous glucose monitoring revealed significant improvements in glucose dynamics: mean glucose levels decreased by about 4mg/dL, while measures of glucose variability and smoothness also improved.

Gut microbiota analysis showed notable shifts, with increases in beneficial butyrate-producing

genera such as *Blautia*, *Faecalibacterium*, and *Coprococcus*, alongside decreases in *Prevotella* and *Oscillospira*.

These microbial changes were linked to improved glucose regulation, suggesting that individuals with higher baseline levels of butyrate-producing bacteria experienced greater benefits.

The findings highlight yogurt's potential as a dietary intervention in the pre-diabetic stage, not only for its metabolic effects but also for its role in reshaping gut microbiota.

The study underscores the importance of personalized nutrition strategies, where microbial composition could guide tailored dietary recommendations to prevent or manage metabolic disorders.

The results were published in *The Journal of Nutrition* and presented at the Japan Diabetes Society's annual meeting, reinforcing yogurt's promise as a functional food in metabolic health management.

<https://www.nutraingredients.com/Article/2026/06/15/meiji-study-finds-probiotic-fermented-yogurt-improves-glucose-control-gut-microbiota/>



A recent study published in *eBioMedicine* suggests that omega-3 fatty acids may support brain health more effectively when consumed as part of a Mediterranean-style diet rather than through fish oil supplements alone.

Researchers at the University of Southern California tracked 365 adults aged 55 to 80 who rarely ate fish and were considered at risk for Alzheimer's disease. Participants received either a daily high-dose omega-3

supplement containing 2,000 milligrams of DHA or a placebo over two years.

The study confirmed that DHA from supplements reached the brain, with cerebrospinal fluid levels rising

by 17 percent after six months. However, participants showed no improvement in memory, cognition, or markers of brain aging compared to the placebo group.

Brain scans also revealed no difference in hippocampal shrinkage, a key indicator of Alzheimer's risk. Lead investigator Hussein Naji Yassine emphasized that while omega-3s are vital for forming brain cell connections, fish oil supplements did not appear to

protect against cognitive decline.

Researchers believe omega-3s may be more beneficial when consumed within the context of a Mediterranean-style diet, which naturally combines omega-3s with other nutrients and lifestyle factors linked to reduced Alzheimer's risk.

They are now exploring how health status, genetics, and age influence the brain's ability to absorb and use omega-3s, and whether medications could enhance this process.

The study also reinforced that broader lifestyle habits—such as regular exercise, quality sleep, and balanced nutrition—remain essential for maintaining brain health.

<https://www.globalseafood.org/advocate/study-suggests-omega-3s-may-work-better-in-mediterranean-diet-than-fish-oil-supplements/>

Image © iNaturalist

Erinacine A leads lion's mane category shift from nootropic to healthy brain aging

neuronal health and resilience during aging.

Human studies, though still limited, have reported improvements in cognitive and auditory function among older adults, alongside biomarker changes consistent with

healthier brain function. The strongest evidence so far lies in aging populations rather than younger, healthy adults.

Skye Chilton, CEO of Real Mushrooms, emphasizes that erinacine A represents a broader industry shift toward identifying and standardizing specific bioactive compounds in mushrooms, moving beyond treating lion's mane as a single undifferentiated category.

The compound differs from hericenones, which are found in the fruiting body of lion's mane. While hericenones also support nervous system health, erinacine A has stronger clinical evidence and acts through distinct mechanisms. Used together, they can complement each other in formulations aimed at long-term brain health

and resilience.

Chilton cautions against premature neuroprotection claims, noting that while cell and animal studies suggest protective effects, larger and more robust human trials are needed to confirm these findings.

The biggest research gaps include the need for well-controlled human studies to establish efficacy, a clearer understanding of how erinacine A works in the brain, and identifying which populations benefit most.

Chilton stresses that mycelium-based products should verify erinacine A content rather than assume its presence. Ultimately, the opportunity lies in positioning erinacine A not as a stimulant-like nootropic, but as a standardized neuroadaptogen that contributes to healthy brain aging within the broader matrix of lion's mane compounds.

<https://www.nutritioninsight.com/news/erinacinea-mushroom-brain-supplements-lions-mane.html>

The article you're reading highlights how erinacine A, a compound found exclusively in lion's mane mycelium, is reshaping the category from being marketed as a quick-fix nootropic to a long-term neuroadaptogen for healthy brain aging.

Real Mushrooms positions erinacine A as a resilience-building ingredient that supports nervous system adaptability over time, rather than delivering immediate boosts in focus or attention.

Current research shows that erinacine A can cross the blood-brain barrier and influence neurotrophic pathways involving nerve growth factor (NGF) and brain-derived neurotrophic factor (BDNF), both critical for maintaining



FOOD SCIENCE & INDUSTRY NEWS

Biotics and HMOs Expand from Infant Formula into Adult Nutrition with Multi-Ingredient Formats

The document outlines how biotics and human milk oligosaccharides (HMOs), once primarily associated with infant formula, are rapidly expanding into adult nutrition through multi-ingredient formats such as gummies, functional beverages, and synbiotic solutions.

Global product launches containing HMOs rose by more than 50% between 2024 and 2025, with Asia leading innovation, particularly in markets like Vietnam, the Philippines, India, and China. These formulations increasingly combine HMOs with probiotics, prebiotics like galactooligosaccharides (GOS), and bioactive compounds such as milk fat globule membrane (MFGM) and lactoferrin,

targeting whole-body health, immune resilience, gut-brain axis support, and healthy aging.

Regional trends show Asia-Pacific driving synbiotic and functional positioning, Europe focusing on metabolic health and stress, and North America emphasizing clinical substantiation and commercialization. Innovation is shifting from single-strain products to multi-benefit, system-level solutions that integrate probiotics, prebiotics, postbiotics, and emerging co-biotics. Examples include dsm-firmenich's Humiome portfolio, which combines targeted strains with HMOs and postbiotics, and its Humiome B2 with Microbiome Targeted Technology, designed to deliver vitamin B2 to the colon for microbial diversity and host health.

Clinical research highlights HMOs' role beyond infant immunity and gut health, linking them to cognitive and social development. Yeast-based probiotics like Gnosis by

Lesaffre's ibSium demonstrate efficacy in managing irritable bowel syndrome (IBS) symptoms and improving quality of life, while Quatreflora supports women's vaginal health. In sports nutrition, Clasado Biosciences' Bimuno GOS has shown benefits in reducing gut barrier damage and improving gastrointestinal comfort in athletes under intense training conditions.

The future of biotics is moving toward personalized, science-driven nutrition across life stages, with formats like drinkable yogurts, gummies, and snack bars. Key growth areas include synbiotics for sleep quality, biotics as companions to GLP-1 treatments to manage gastrointestinal side effects, and targeted blends that enhance probiotic effectiveness. However, dosing remains a critical challenge, as clinically proven levels are essential for efficacy and stability. Overall, biotics and HMOs are evolving into holistic, multi-ingredient solutions that connect gut health to immunity, cognition, performance, and long-term well-being.

<https://www.nutritioninsight.com/news/hmo-biotics-dsm-firmenich-clasado-biosciences-gnosis-by-lesaffre-valio.html>

Functional Beverages: Balancing Taste, Science and Scale as Consumers Demand "More Per Sip"

Functional beverages are evolving into multi-benefit products that go far beyond simple hydration, with consumers increasingly

expecting energy, protein, gut health, recovery, and digestive comfort in every sip.

The category is being shaped by the demand for "more per sip," where taste, clean labels, sugar reduction, and formulation stability must be balanced with credible, science-backed health advantages. Repeat purchase

depends on noticeable benefits that do not compromise flavour or drinking experience.

Hydration has shifted from being a differentiator to a baseline expectation, leading to "benefit stacking" where drinks combine hydration with targeted outcomes such as focus, recovery, or resilience throughout the day.

Protein fortification has moved from niche sports nutrition into mainstream consumption, with clear protein waters, recovery drinks, and hybrid formats like protein coffees gaining traction. Clinical backing and formulation stability are critical, as ingredients must remain soluble, neutral in taste, and stable under processing conditions.

Natural and hybrid innovations are fuelling growth, with nootropics, adaptogens, and plant-based energy sources such as matcha, cacao, and L-theanine offering alternatives to traditional stimulants. Companies are experimenting

with experiential bioactives that deliver perceptible results, while taste modulation technologies are being used to overcome off-notes and chalkiness in high-protein or reduced-sugar beverages.

Regional differences shape product development, with Europe emphasizing gut health, immunity, and clean label transparency, North America focusing on energy, performance, and mood, and Asia-Pacific prioritizing lactose-free protein solutions due to higher rates of intolerance. Tea-based functional beverages resonate strongly in Asia, while

sports drinks and flavoured waters dominate in Western markets.

The future of functional beverages will be defined by products that deliver credible, science-backed benefits that consumers can feel, combined with enjoyable taste and convenience. Success will come from aligning clear use occasions with proven functionality and a satisfying drinking experience, ensuring that every serving provides real value.

<https://www.foodingredientsfirst.com/news/functional-beverage-boosts-benefit-stacking.html>

Bakery Innovation Trends: How Are Social Media, Sustainability and Personalization Reshaping NPD?

The Dawn Foods 2026 Trend Report highlights how bakery innovation is being reshaped by social media influence, sustainability priorities, and consumer demand for personalization.

Social media platforms such as Instagram and TikTok are driving discovery, with visually engaging posts and viral trends influencing more than half of consumers to purchase bakery items. This digital exposure is also expanding interest in global flavours, as initiatives like Dawn's "Flavour Passport" bring international inspirations into local bakery contexts.

The report identifies four major trends: "sweet connections," which emphasize social media engagement and global flavour exploration; "elevated indulgence," reflecting the rise of small, everyday treats as affordable luxuries; "simple pleasures,"

where heritage and comfort foods regain relevance in modern formats; and "empowering choices," which capture the growing demand for personalized, sustainable, and lifestyle aligned bakery products.

Consumers increasingly seek bakery items that remind them of childhood, connect them to cultural traditions, or fit dietary preferences such as vegan, gluten free, or high protein options.

Sustainability is a strong driver, with three out of five consumers showing loyalty to

brands committed to sustainable practices.

At the same time, personalization is shaping product development, as more than half of consumers prefer bakeries catering to diverse dietary needs. Industry efforts include sugar reduction, mindful indulgence formats, and versatile mixes that balance taste with health considerations.

Ultimately, bakery innovation is moving toward products that combine emotional satisfaction, cultural heritage, and modern values, while leveraging digital platforms to amplify reach and relevance.

This convergence of social media visibility, sustainability, and personalization is redefining how new bakery products are developed and experienced.

<https://www.foodingredientsfirst.com/news/dawn-foods-sweet-bakery-trends-global-flavors.html>

From Tradition to Evidence: ASEAN Emerges as Key Market for Botanical Innovation

Southeast Asia is emerging as a major growth market for botanical innovation, driven by its large population, dynamic economies, and cultural familiarity with holistic health traditions.

The ASEAN region, comprising 11 member states and nearly 700 million people, already has a supplement market valued at around \$6 billion, with Thailand, Indonesia, and Vietnam accounting for the majority. Consumers in the region are deeply attuned to concepts of balance, vitality, and energy, shaped by traditions such as Ayurveda, yoga, and meditation, but increasingly demand scientific validation, reproducibility, and regulatory-grade documentation for wellness products.

Greenspace Herbs is positioning itself at the intersection of tradition and modern science through its Quantum Ayurveda platform, which integrates classical Ayurvedic principles with advanced analytical techniques like Raman spectrophotometry, electron

microscopy, nuclear magnetic resonance, AI-driven formulation, and chronobiology-based dosing. This

approach aims to enhance the bioavailability and consistency of botanical ingredients, mapping tens of thousands of bioactive signatures to build a robust scientific foundation.

The company's most focused launch in ASEAN is EASI™, a new generation of bio-enhanced nutraceutical actives, and BerberineQA™, an energized, highly bioavailable form of berberine designed for improved solubility, faster uptake, and sustained presence in the body. These products target key consumer priorities such as metabolic health, gut wellness, healthy ageing, mood, and preventive health, reflecting regional trends toward condition-specific daily wellness and modernization of traditional remedies.

Regulatory compliance is central to this strategy, as ASEAN regulators are harmonizing standards for traditional medicines and supplements, covering safety, claims substantiation, GMP, labelling, and contaminants. Greenspace emphasizes that its Quantum Ayurveda ingredients

are classified as dietary supplements supporting normal physiological function and general well-being, not as treatments or cures.

The timing aligns with growing global interest, as Greenspace has already showcased its platform at Vitafoods Europe and is preparing for Vitafoods Asia 2026 in Bangkok, which will bring together industry leaders from across the region. The opportunity lies not in importing supplements but in revitalizing Asia's botanical heritage with stronger analytics, reproducibility, and regulatory humility. BerberineQA is positioned as a flagship product that embodies ASEAN's cultural language of balance and vitality while remaining anchored in measurable scientific rigor.

Ultimately, ASEAN represents a natural arena to test whether ancient energetic frameworks like Ayurveda can be translated into modern supplement science without losing their cultural essence or scientific credibility.

<https://www.nutraingredients.com/https://www.nutraingredients.com/News/Promotional-features/from-tradition-to-evidence-asean-emerges-as-key-market-for-botanical-innovation/>

The F&B Jobs AI Is Targeting, But Is It Really That Dire?

The document explores how artificial intelligence is reshaping jobs in the food and beverage industry, not through outright elimination but by fundamentally redesigning roles.

AI is accelerating product development by modelling millions of ingredient combinations before lab testing, cutting timelines dramatically—as seen in Kraft Heinz's partnership with NotCo, which reduced the development of plant-based mac & cheese from two years to ten months. This shift moves R&D teams from manual trials to computational oversight.

Automation is also advancing into areas once resistant to mechanization, such as fresh food handling. AI-enabled machine vision now allows robots to interpret irregular shapes and handle delicate tasks, with suppliers like Millitec already producing hundreds of thousands of sandwiches daily using AI-driven machines. While repetitive factory roles are declining,

demand is rising for technical oversight, systems management, and process optimization.

Beyond the factory floor, AI is being deployed in supply chain resilience, pricing, and reformulation. Companies like Mondra use AI to model disruptions and redesign products, enabling supermarkets to create meals that are more nutritious, sustainable, and profitable. Forecasting and demand planning are also becoming more sophisticated, reducing reliance on manual data

modelling and making advanced analytics accessible even to smaller firms.

The jobs most at risk include product formulators reliant on trial-and-error, quality control inspectors, repetitive line workers, forecasting analysts, nutrition and labelling specialists, procurement analysts, and reactive maintenance teams. Yet experts argue that AI is not simply replacing these roles but augmenting them, shifting maintenance toward predictive diagnostics and enabling sourcing managers to handle

complex data sets.

The article concludes that while AI is undeniably reducing headcount in some areas, the bigger story is role transformation. Human expertise remains essential for creativity, sensory judgment, and the cultural appeal of food. As one consultant notes, AI can provide insight and starting points, but making food “sexy” again requires the human touch.

<https://www.foodnavigator.com/Article/2026/05/27/ai-reshapes-fb-jobs-as-automation-hits-product-rd/>

Sports Nutrition Is No Longer Constrained by Its Fundamental Benefit.

Sports nutrition is evolving beyond its traditional focus on energy and exercise performance, becoming a more holistic category that integrates immune, digestive, cognitive, and overall wellbeing benefits.

Consumer behaviour reflects this shift: surveys show rising supplement use, with many athletes and active professionals now seeking products that deliver broader health gains such as endurance, bone and joint support, vitality, and sleep health. In Asia, supplements are increasingly viewed as part of daily routines rather than exercise companions, highlighting a cultural preference for long-term health maintenance.

Central to this transformation is the gut microbiome, which influences not only digestion and immunity but also mood, cognition, and physical performance. Research

indicates that microbial diversity is a key determinant of resilience, with traditional Asian diets rich in fermented foods offering advantages

compared to Western diets that often lack fiber and diversity. However, beneficial bacteria naturally decline with age, making prebiotics and probiotics important tools to sustain gut health and extend healthspan.

Probiotics, particularly clinically validated strains like *Lactiplantibacillus plantarum* 299v (LP299V®), are gaining traction in sports nutrition. LP299V has been extensively studied, with evidence showing it enhances iron absorption by converting ferric iron (Fe³⁺) into its more bioavailable form (Fe²⁺), supporting nutrient uptake and performance. Clinical trials in female athletes demonstrated improved ferritin levels and VO2 max when LP299V was combined with iron supplementation, linking better iron bioavailability to enhanced cellular respiration and endurance.

Despite challenges in formulation and regulation, probiotics represent a significant innovation opportunity for sports nutrition brands. Companies like Probi, with decades of research and global market experience, are positioned to deliver microbiome-centric solutions across diverse applications such as shakes, smoothies, and functional beverages. Their strains are designed to withstand processing conditions and maintain efficacy, making them suitable for commercial use.

Ultimately, the future of sports nutrition lies in science-backed formulations that go beyond energy to support holistic health. Brands that can prove efficacy through clinical validation will build consumer trust and loyalty, ensuring relevance in a market increasingly driven by demands for transparency, functionality, and long-term wellbeing.

<https://www.foodnavigator.com/https://www.foodnavigator-asia.com/News/Promotional-features/probiotics-support-active-lifestyles-and-performance/>

East Meets West: How AI And Social Commerce Are Reshaping the Future of Retail

The NielsenIQ report highlights how retail is being reshaped by the convergence of Eastern innovations in social and quick commerce with Western strengths in data-driven personalization.

In Asia-Pacific, consumers are rapidly adopting quick commerce, with 58% using 30-minute delivery services and 59% engaging in social commerce purchases directly through apps like Douyin/TikTok. By contrast, most Western consumers have yet to embrace these models,

but retailers there are more advanced in leveraging retail media and AI to deliver hyper-personalized shopping experiences.

At the centre of this transformation is agentic AI, which acts as a decision engine for consumers. Instead of shoppers manually searching, comparing, and deciding, AI agents increasingly surface relevant products, interpret intent, and prioritize options. This collapses the traditional purchase funnel and shifts product discovery into an AI-driven process. Early signs of this agent-assisted commerce are already visible, with Morgan Stanley estimating that agentic shoppers could account for \$190–385 billion in U.S. e-commerce spending by 2030, while McKinsey projects a global opportunity of \$3–5 trillion.

For manufacturers and retailers, the implications are profound. Success will depend on structured product data, AI-readable attributes, and cross-platform measurement systems that allow brands to remain visible to AI agents.

Those who invest early in these capabilities will be positioned to capture consumer demand in a unified, intelligent commerce ecosystem, while those who delay risk being overlooked entirely. The report frames this as the beginning of a connected global commerce machine, where AI and social commerce together redefine how demand is generated, captured, and measured.

<https://www.foodnavigator.com/Article/2026/05/28/how-ai-is-merging-eastern-and-western-commerce-into-one-intelligent-ecosystem/>

Bridging The Gap Between Ingredient Innovation and Reality

The article highlights the realities of scaling up ingredient innovations, emphasizing that success depends on early attention to downstream processing, clear market differentiation, and consumer appeal.

Startups often face challenges in translating promising concepts into scalable products due to regulatory hurdles, infrastructure limitations, cost pressures, and technical complexities.

At the Vitafoods Europe Startup Challenge, three finalists

shared their perspectives. Alex Shandrovsky of Ayana Bio explained how his company focused on saffron bioactives because of their high commodity value, making economic sense from the outset.

Mariana Gentilhomem of New Wave Biotech stressed that many startups fail because they overlook downstream processing costs, and her company's AI bioprocess optimization tool aims to help businesses anticipate these challenges early. Professor Marija Lesjak of FeJuice described the difficulty of proving health benefits for a natural iron absorption enhancer while differentiating it from pharmaceutical

alternatives, noting that quality control is complicated by the presence of iron inhibitors in many ingredients.

The discussion also touched on broader industry dynamics. Shandrovsky raised the "innovators' dilemma," where established companies may hesitate to disrupt their own vertically integrated supply chains despite the potential of new technologies.

Gentilhomem positioned AI as a way to accelerate R&D by simulating thousands of processes to identify optimal pathways. Lesjak reminded innovators that beyond economics and science, products must still taste good, look appealing, and deliver satisfying mouthfeel to succeed in the market.

Overall, the conversation underscored that while innovation is vital, scalability requires balancing technical

feasibility, economic logic, consumer acceptance, and supply chain realities.

<https://www.vitafoodsinsights.com/startups/bridging-the-gap-between-ingredient-innovation-and-reality>



Taste Is No Longer King in Snacking

The 2026 State of Snacking report from Mondelez International highlights a shift in consumer priorities, showing that taste is no longer the sole driver of snack choices.

Instead, visual appeal, texture, and emotional connection are becoming central to how people discover and evaluate food. Social media plays a major role, with consumers often encountering snacks on screens before seeing them in stores. Products that photograph well, sound satisfying, or offer dramatic sensory experiences—like the viral Dubai Chocolate—are more likely to become cultural

phenomena.

Texture is emerging as a key innovation platform, with consumers across markets valuing crunch, contrast, and multisensory experiences. In Germany, two-thirds of snackers are drawn to products with multiple textures, while in Thailand and India, crunch and texture contrast are strongly linked to enjoyment. This focus on sensory appeal extends beyond taste, reshaping how products are marketed and consumed.

The report also reveals that consumers are rejecting traditional trade-offs. They expect snacks to deliver indulgence, novelty, comfort, wellness, and emotional satisfaction simultaneously. Comfort remains a strong driver, with many associating snacking with stress relief and

relaxation, while nostalgia continues to influence brand loyalty. At the same time, novelty and global flavour exploration are gaining traction, especially among younger consumers exposed to diverse food trends online.

Overall, Mondelez's findings suggest that successful products must combine multiple consumer needs—visual appeal for discovery, texture for experience, and emotional resonance for lasting loyalty. This evolution in snacking behaviour reflects broader changes across food and beverage categories, where consumers increasingly eat with their eyes, ears, and emotions as much as with their taste buds.

<https://www.foodnavigator.com/Article/2026/06/17/mondelez-2026-state-of-snacking-report-reveals-sense-is-king/>



Functional Snacks on Social Media Aren't Replacing Indulgence, They're Justifying It

Spate's 2026 trend report on functional snacks shows that the category is evolving beyond simple nutrition claims into a more layered, emotional, and culturally rich space.

While protein remains the anchor ingredient, with 1.3 million searches and steady growth, consumers are increasingly seeking snacks that

deliver specific benefits such as energy support, better sleep, or cognitive recovery. This reflects a broader "optimize everything" mindset, where snacks are expected to serve functional roles throughout the day while still tasting indulgent.

Social media is driving much of this change, with DIY recipes like protein cookie dough gaining traction on TikTok. These formats allow consumers to justify indulgence by incorporating healthier ingredients such as protein powder, Greek yogurt, or cottage cheese.

The trend highlights how indulgence and functionality are no longer opposites but complementary forces in modern snacking.

At the same time, culturally significant ingredients are breaking into the mainstream. Black sesame, a traditional Asian staple, has seen explosive growth in online searches, fuelled by TikTok-led discovery and associations with hormonal health and holistic wellness. Its rise underscores how consumers are drawn to ingredients that combine authenticity, cultural heritage, and functionality, offering both novelty and comfort.

Overall, functional snacking is shifting from a focus on macros like protein to a more holistic approach that blends health benefits, indulgence, and

cultural resonance. This creates opportunities for brands to innovate with ingredients that not only deliver measurable outcomes but also connect

emotionally and culturally with consumers.

<https://www.foodnavigator.com/Article/2026/06/18/functional-snacking-trends/>

Ashwagandha And Mushrooms Fuel Rise of Relaxation Beverages

The US functional beverage market is seeing rapid growth in the relaxation and mood drink segment, driven by consumer demand for calm, sleep support, and alcohol-free social alternatives.

Ashwagandha and mushrooms are leading the charge, with ashwagandha sales rising by 151% in 2024 and reishi mushrooms growing by 54.7%. Other ingredients such as magnesium, lion's mane, cordyceps, and L-theanine are also gaining traction, reflecting a broader interest in adaptogens and natural stress-relief solutions.

This trend is shaped by generational differences. Gen Z is moving away from alcohol, favouring mood and focus drinks tied to digital lifestyles, while older consumers prioritize cognitive health, calm, and sleep. Brands are responding with products that emphasize subtle functionality and emotional appeal rather than overt stress claims. Playful branding and familiar flavours are proving effective in making these beverages approachable.

New entrants highlight the diversity of approaches. Psilly Goose positions itself as a modern alcohol alternative, offering both THC-free and THC-containing options with ingredients like kanna and

lion's mane mushroom. Melting Forest focuses on mushroom-based drinks with adaptogens and L-theanine, expanding into GNC with varieties designed for calm and focus. Vibes, launched in Florida, takes an occasion-based approach, engineering each SKU to replace alcohol in specific social settings.

Together, these developments show how relaxation beverages are evolving into a mainstream category, blending functionality, cultural appeal, and lifestyle positioning to meet consumer needs for stress relief, social connection, and healthier alternatives to alcohol.

<https://www.foodnavigator.com/Article/2026/06/18/psilly-goose-vibes-tap-booming-mood-drink-market/>

Is 'Healthy Enough' The New 'Better for You?'

Circana's 2025 New Products Pacesetters report highlights a shift in consumer perception from "better-for-you" to "healthy enough," a positioning that balances indulgence with health rather than focusing solely on reduced or free-from formulations.

"Healthy enough" emphasizes the inclusion of core functional ingredients such as protein or

fibre within indulgent formats, making products feel approachable while still supporting health goals. This trend is further accelerated by the rise of GLP-1 medications for weight loss, the growing number of snacking occasions, and consumer interest in functional ingredients.

Convenience is another major driver, with ultra-convenience formats delivering restaurant-quality experiences at home, such as Perdue's Air Fryer Ready Chicken Wings. Discovery is increasingly happening through social media and e-commerce, where influencer-driven

launches and strategic retail partnerships help brands gain traction. Frosh, a children's protein juice brand backed by celebrity founders, exemplifies how visibility and credibility can be built through targeted distribution and cultural relevance.

Collaboration and crossover strategies are becoming foundational, moving beyond one-off marketing tactics to create products that blend established trust with novelty. The Jolly Rancher partnership with indie RTD brand Ryl Tea illustrates how iconic flavours can be reimaged in modern contexts, appealing to both nostalgia and innovation.

Looking ahead, two themes stand out as enduring: balanced health, where consumers expect products to deliver both functional benefits and

memorable sensory experiences, and collaboration, which is predicted to remain a key strategy for driving credibility and cultural

relevance across categories.

<https://www.foodnavigator.com/Article/2026/06/17/balanced-health-collabs-define-2025-food-trends/>

Are Reformulation Demands Moving Faster Than Brands Can Respond? Hear From PepsiCo and Industry Leaders

The debate around food reformulation is intensifying as manufacturers struggle to keep pace with shifting demands from regulators, consumers, and public health advocates.

What began as a relatively straightforward push to reduce sugar, salt, and fat has expanded into a much broader conversation about additives, processing methods, ingredient transparency, and even how foods are classified. This constant evolution means that by the time companies adapt to one set of requirements, new expectations are already emerging, creating a cycle that is difficult to manage within typical product development timelines.

Industry leaders, including PepsiCo's Kiran Annapragada, acknowledge the challenge of reformulating at scale without compromising taste, performance, or consumer appeal. Regulatory bodies continue to raise the bar, while consumer aspirations often clash with purchasing behaviour—shoppers say they want healthier products but still prioritize taste, convenience, and indulgence at the shelf. Experts from the European Snacks Association and the American Bakers Association highlight how these pressures are converging across markets, with policymakers demanding progress that may not always align with what is technically or commercially feasible.

Consumer insights add another layer of complexity. While clean labels and functional benefits are increasingly valued, indulgence and familiarity remain powerful drivers. Anne-Marie Roerink of 210 Analytics emphasizes the difficulty of distinguishing

between what consumers say they want and what they actually buy. Meanwhile, Joanne Burns of FDF Scotland's Reformulation for Health Programme points out that meaningful progress often looks far more complicated in practice than it does on paper.

The central tension is clear: reformulation is no longer just about tweaking recipes but about navigating a constantly moving definition of "better." Manufacturers must balance innovation with regulatory compliance, consumer expectations, and commercial realities, all while ensuring products remain appealing and competitive. The upcoming industry webinar aims to explore whether reformulation is delivering the intended results and how companies can continue to innovate when the rules keep changing.

<https://www.foodnavigator.com/Article/2026/06/16/food-reformulation-can-manufacturers-keep-pace-with-changing-demands/>

Four Trends Shaping Sweets and Snacks In 2026

The FoodNavigator feature on sweets and snacks in 2026 identifies four major forces reshaping the category.

Innovation is increasingly focused on balancing fun,

flavour, and function, reflecting how consumers are redefining indulgence. Reformulation remains central, with brands working to reduce sugar and incorporate protein, fibre, and other functional ingredients without compromising taste. Flavour experimentation is also accelerating, with bold and unexpected combinations designed to capture attention and create excitement.

At the same time, colour and sensory appeal are becoming more important, as products must stand out visually in a crowded marketplace and appeal to consumers who often discover snacks through social media. Finally, the push toward cleaner labels and transparency continues to influence development, as shoppers demand products that feel both healthier and more authentic.

Together, these trends show how sweets and snacks are evolving into a space where indulgence, health, and

discovery intersect, driving innovation across confectionery and snack categories.

<https://www.foodnavigator.com/Article/2026/05/27/4-trends-shaping-sweets-and-snacks-in-2026/>

Snack Trends: Nutrient-Dense Grazing Hitting Its Stride

The latest snack trend report highlights how nutrient-dense grazing is reshaping eating habits, with consumers increasingly replacing fixed meals with smaller, portable formats that deliver satiety, nutrition, and convenience.

Healthy snacking has shifted from niche behaviour to a daily routine, with 79% of consumers snacking every day and 42% doing so two to three times daily. This has accelerated the rise of “intentional grazing,” particularly among younger, busier consumers who seek snacks that provide energy and

functional benefits throughout the day.

Protein bars, nut packs, grain clusters, and trail mixes exemplify this movement, combining indulgence with functional nutrition. Functional ingredients such as protein, fibre, and natural components are now considered essential, while opportunities are emerging in personalized nutrition and gut health. Innovations include PepsiCo's investment in oat research for cardiovascular health, Farm Fresh's matcha-infused chicken nuggets, and Calbee's collaboration with Singapore start-up AMILI to launch Body Granola, a personalized subscription service based on gut microbiome testing. Japanese firm Hananomi LLC has introduced amazake jelly sticks and soy protein crisps,

positioning them as complementary snacks for all-day nourishment.

The trend also extends into beverages, with New Zealand's Lullaa launching SmartMilk as a functional milk category designed for long-term daily consumption. These examples illustrate how the line between snacks, beverages, and daily nutrition is blurring, creating new opportunities for brands to deliver convenience, functionality, and cultural appeal. Healthy snacking has become mainstream, with consumers expecting products that balance indulgence, nutrition, and portability in formats that fit seamlessly into modern lifestyles.

<https://www.foodnavigator.com/Article/2026/06/08/snack-trends-nutrient-dense-grazing-reshapes-meal-occasions/>

Combination Of Probiotic, Antacid Amid Rising Self-Care Trend

Bayer India has introduced a new version of Alka Seltzer that combines an antacid with probiotic support, marking the first product of its kind in India's ayurvedic category.

The formulation blends *Svarjiksara (Shudh)*—purified sodium bicarbonate, traditionally used for acidity relief—with a *Lactobacillus* probiotic derived from Indian

curd extract (*dahi*). This approach draws on long-standing Indian dietary practices where curd and buttermilk are associated with digestive comfort, while also addressing modern consumer interest in gut health.

The product comes in single-use effervescent powder sachets and is designed to provide both fast-acting relief from acidity, gas, and indigestion, as well as longer-term digestive health support. Bayer has adopted a digital-first strategy for distribution, leveraging chemists, e-commerce, e-pharmacies, q-commerce, and modern trade, supported by sampling and in-

store visibility.

The launch reflects broader trends in India's self-care market, where nearly seven in ten people report digestive issues weekly or daily, and preventive health awareness is rising. With the Indian consumer health market valued at around US\$4.2 billion and growing at 7–8% annually, Bayer sees significant potential for India to become one of the top three global self-care markets. Factors such as a young population, increasing health awareness, and one of the world's most advanced digital ecosystems are driving this growth.

By combining symptom relief with wellness support, Bayer's innovation signals a shift in the antacid category toward

products that meet evolving consumer expectations for convenience, accessibility, and holistic digestive health.

<https://www.nutraingredients.com/Article/2026/06/24/bayer-india-combines-probiotics-antacid-amid-rising-self-care-trend/>

Energy Bars for Stress: Targets Market Gaps with New Launch

The Monday Bar, developed by Mumbai-based consulting firm Never Grow Up, has been launched to address stress and mental fatigue rather than athletic performance, filling a gap in India's functional bar market.

Unlike most energy bars that focus on protein supplementation or quick calories for exercise, The Monday Bar is designed for sustained mental and physical demands of modern working life.

Its formulation combines four stress-oriented botanicals—ashwagandha, jatamansi, chamomile, and valerian root—at defined extract levels per bar, alongside prebiotic fructooligosaccharides (FOS).

Each 40g bar contains 200mg of ashwagandha extract for cortisol modulation and steadier energy, 200mg of jatamansi extract for focus and composure through GABAergic modulation, 25mg of chamomile extract to promote

relaxed alertness, and 25mg of valerian root extract for natural sedative and anxiolytic effects.

The botanical blend is intended to support stress relief, mental steadiness, and long-term health without relying on caffeine or added sugar.

The bar also incorporates oats, dates, cashews, pea protein isolate, and cocoa, avoiding refined sugar and heavy binders like rice or tapioca syrups that can cause energy spikes and crashes.

Dates and limited coconut sugar keep the glycemic index low, while cocoa contributes polyphenols that may influence blood flow and mood pathways. Natural preservatives such as rosemary extract are used to

balance taste, texture, and shelf stability while maintaining a clean-label profile.

Market research cited by the company shows that energy bars in India are still largely perceived as occasional gym snacks or diet aids rather than daily staples.

The Monday Bar aims to shift this perception by positioning itself as an everyday nutraceutical snack for professionals and students dealing with deadlines, exams, and chronic stress.

It is currently available through direct-to-consumer sales on its official website, as well as corporate and bulk orders, with the brand emphasizing ingredient transparency, low-GI formulation, and alignment with consumer demand for sustainable work-life health solutions.

<https://www.nutraingredients.com/Article/2026/05/28/never-grow-ups-the-monday-bar-seeks-to-fill-gaps-in-indian-functional-bars/>





REGULATORY NEWS

Deepfake food fraud threatens global brands

There is growing threat of AI-assisted food fraud, where manipulated images and AI-generated complaint letters are increasingly used to deceive food businesses, regulators, and delivery platforms.

Fraudsters are creating convincing photographs of contaminated or defective products—such as mouldy muffins or glass in cookies—alongside fabricated correspondence that mimics legal or consumer advocacy language. These tactics are designed to secure refunds, compensation, or regulatory action, and they exploit the fact that consumers and businesses alike struggle to distinguish synthetic content from genuine evidence.

Food Alert, a UK consultancy, reports handling cases involving such manipulated images and notes that the rapid rise of AI tools has made fraud easier and more accessible. Studies show that most consumers cannot reliably tell the difference between AI-generated and real food photography, while similar confusion exists with restaurant reviews. This undermines trust in digital commerce and creates reputational risks for brands, as false contamination claims can spread quickly across social media before verification is possible.

The problem is compounded by regulatory gaps. Current food fraud legislation was not designed to address synthetic images or deepfakes, leaving businesses exposed. Safeguards such as watermarking and deepfake labelling are inconsistently applied, and metadata can be easily stripped

away. Fraudulent complaints can trigger inspections and affect hygiene ratings even when disproved, adding financial and regulatory burdens.

Experts warn that reputational damage may be the most significant consequence, as manipulated images can erode consumer trust across markets. Incidents involving platforms like Instacart and Forkable, which faced backlash for using AI-generated food images, illustrate the growing unease around authenticity in food marketing.

Food Alert advises businesses to strengthen complaint management systems, train staff to recognize suspicious patterns, and develop robust processes to detect coordinated fraud. With AI technology advancing rapidly, the challenge is expected to intensify, making resilience and structured oversight critical for food brands in the coming years.

<https://www.foodnavigator.com/Article/2026/06/12/ai-food-fraud-the-new-threat-facing-global-brands/>



Ashwagandha Standards Alliance Opens Global Membership Amid India Regulatory Scrutiny

The Ashwagandha Standards Alliance (ASA) has opened global membership in response to heightened regulatory scrutiny in India, particularly around the use of ashwagandha leaves.

India's Food Safety and Standards Authority (FSSAI) and the Ministry of AYUSH have

advised against leaf use, labelling it unsafe or adulterated, while permitting root use in supplements. ASA argues that the issue is more nuanced than "root good, leaf bad," stressing the need to distinguish between adulteration and truthfully labelled, science-backed ingredients.

Founded by companies including Sabinsa, Cepham, and Arjuna Naturals, ASA aims to strengthen industry and public understanding of ashwagandha

through science-based standards. Its priorities include safety, quality, education, analytical harmonization, transparency, and public trust. The alliance emphasizes that it is not a trade group but a structurally independent initiative focused on accurate information and responsible communication. It has already supported industry efforts that led to a temporary court stay against FSSAI's attempt to restrict leaf use, allowing time for fuller legal and scientific review.

ASA's leaders highlight that undeclared substitution of plant parts should be taken seriously, but truthfully labelled products manufactured under Good Manufacturing Practices should be evaluated based on evidence of safe use. They note that safety concerns raised by regulators—such as

potential effects on thyroid, immune function, and liver health—are being addressed by growing scientific data, particularly in Europe. The alliance is inviting a wide range of stakeholders, from suppliers and manufacturers to researchers, clinicians, and consumers, to join in building

standards that preserve public trust while supporting the herb's global role in health and wellness.

<https://www.nutritioninsight.com/news/ashwagandha-standards-alliance-membership.html>

British Nutrition Foundation Offers Food Industry Guidance to Close the UK Fibre Gap

The British Nutrition Foundation's latest report highlights the UK's persistent fibre deficiency, with only about 4% of adults meeting the recommended daily intake of 30 grams.

The analysis shows that staple foods such as bread and cereals, though not particularly high in fibre, contribute most to intake because they are consumed in large quantities. This insight underpins the BNF's recommendation for a "health by stealth" approach, where staple foods are gradually reformulated to contain more fibre without altering taste or texture. Alongside reformulation, the report emphasizes the importance of increasing consumption of naturally fibre-rich foods such as whole grains, beans, fruits, vegetables, nuts, and seeds.

The report identifies several barriers to higher fibre intake, including limited consumer awareness, cost, convenience, preparation skills, and concerns about gastrointestinal tolerance. It suggests fortification strategies using ingredients like spent grain, resistant starch, oat bran, and pectin, while noting that the health effects of added fibres may differ from those naturally present in whole foods. Biofortification, which enhances fibre content in crops through breeding, is presented as a longer-term solution. Bakery products, particularly bread, are singled out as a key vehicle for increasing intake due to their widespread consumption, with modelling studies showing that modest increases in fibre content could significantly raise population-level intake.

The BNF calls for coordinated action across agriculture, manufacturing, retail, and foodservice to improve both supply and demand for high-

fibre foods. It stresses that behaviour change cannot rely on information alone but requires systemic changes in food environments, such as making high-fibre options more available and accessible. Evidence cited in the report links higher fibre intake to reduced risks of cardiometabolic disease and colorectal cancer, while emerging research suggests benefits for cognition, mental health, and immune function. Recent product innovations, including multi-fibre blends and fortified shakes, reflect growing consumer interest, particularly among younger demographics influenced by gut health trends. The report concludes that addressing the fibre gap requires integrated strategies that combine reformulation, innovation, education, and policy support to deliver broad health benefits across the population.

<https://www.nutritioninsight.com/news/british-nutrition-foundation-fiber-gut-health.html>

Report Compares UPF Nutritional Profile and Processing as Health Drivers

The Perspectives commentary explores whether the health risks of ultra-processed foods

(UPFs) stem primarily from the degree of processing itself or from their nutritional profile.

Drawing on randomized controlled trials from Japan, the US, Denmark, and the UK, the report notes that UPF-rich diets often lead to higher calorie intake — about 500 to 800 calories more per day — and

weight gain compared to non-UPF diets. However, one UK trial showed that when UPFs were designed to meet nutritional guidelines, participants actually reduced energy intake and experienced modest weight loss, suggesting that nutritional quality may be more decisive than processing alone.

The commentary emphasizes that UPFs are typically calorie-dense, high in sugar and salt, and low in protein and fibre, which are factors known to drive poor health outcomes regardless of processing. Trials with fixed calorie intake confirmed that UPF diets led to weight gain, while non-UPF diets did not. The authors caution that attributing a metabolic effect of 500 calories daily purely to processing is difficult to reconcile with human physiology, pointing instead to established drivers such as calorie density, fibre, protein, food texture, and eating rate.

Independent experts highlight the limitations of the evidence, noting that the trials were short-term and cannot support definitive policy recommendations. Dr. Sumanto Halder stresses the need for longer studies, while Dr. Seamus Higgins argues that nutrition science may be overly reliant on calorie-based systems developed over a century ago, which fail to capture satiety, microbiome interactions, and metabolic responses. Higgins warns against treating classification systems like Nova as causal explanations, reminding that they were designed as descriptive

frameworks rather than biological models.

Meanwhile, Healthy Eating Research suggests distinguishing between types of UPFs, as some plant-based options may offer health benefits, whereas animal-based UPFs and sugary drinks consistently show harm. Overall, the report underscores that the debate over UPFs remains unsettled, with nutritional quality appearing to play a stronger role than processing alone.

<https://www.nutritioninsight.com/news/upf-processing-vs-nutrition-health-debate.html>

Spotlight On Emulsifiers: Consumer Demand for Clean Label Reshapes Food Formulation Landscape

Emulsifiers have become a focal point in the clean label reformulation movement, as consumer scrutiny of ultra processed foods intensifies and ingredient suppliers seek alternatives that balance functionality with transparency.

Traditional synthetic emulsifiers are difficult to replace directly because they perform multiple roles, including aeration, dough strength, shelf-life extension, and texture. As a result, companies are pursuing different strategies to meet demand for shorter ingredient lists and more familiar declarations.

Cargill is focusing on lecithin as a recognizable substitute in bakery and confectionery, using

it to replace mono and diglycerides or diacetyl tartaric acid esters while rebuilding lost functionalities with proteins, fibres, starches, and enzymes. Lecithin also plays a strategic role in chocolate, helping

optimize viscosity and reduce cocoa butter usage amid volatile market conditions.

Ingredion views clean label emulsification as a systemic challenge rather than a simple swap, developing upgraded natural emulsifiers such as quillaja based Q Naturale and Ticaloid Acacia MAX to stabilize higher oil loads, support natural color systems, and reduce reliance on weighting agents. Fiberstar emphasizes multifunctional consolidation with its Citri Fi citrus fibre, which binds oil up to eight times its weight, enabling emulsification, creamy mouthfeel, and stability in plant based beverages and dairy alternatives without E numbers or allergens.

Applications in plant based meat and dairy highlight the limits of emulsifiers alone, with Cargill using lecithins to retain water for juiciness and Fiberstar leveraging citrus fibre's oil binding capacity to enable lower saturated fat liquid oils. Fiberstar has also introduced Citri Fi Pro to withstand acidic conditions in beverages, offering stability even under extreme pH, temperature, or alcohol content.

Across the industry, the consensus is that clean label emulsification requires whole system redesigns rather than isolated ingredient swaps, with future success depending on solutions that deliver stability, functionality, and consumer friendly labelling while addressing sustainability and cost pressures.

<https://www.ingredientinsights.com/news/clean-label-emulsifier-cargill-fiberstar-ingredion.html>

Increased Scrutiny Over Artificial Additives Accelerates Demand for Natural Colour Alternatives

The food and beverage industry is accelerating its move away from synthetic dyes such as Red Dye No. 40 due to heightened consumer concerns and regulatory scrutiny over artificial additives.

This shift is creating significant formulation challenges, as natural alternatives must match the stability, consistency, and vibrant visual appeal of synthetic colours while supporting clean label goals.

Replacing Red 40 is particularly complex because red shades are widely used across categories like beverages, cereals, candies, and desserts, and are

strongly associated with flavours such as cherry and strawberry. Natural colour suppliers are responding with plant based solutions derived from sources like red carrot, red radish, and beet, which can deliver shades ranging from bright reds to deep magentas. Advances in ingredient delivery systems are helping close the performance gap, with innovations such as proprietary crystal colour formats offering higher concentration, longer shelf life, and improved storage flexibility compared to traditional liquid systems.

Consumer preference for recognizable, minimally processed ingredients is driving reformulation efforts, with studies showing clear favourability toward natural colours over artificial ones. Awareness of state and federal

initiatives to phase out synthetic dyes is also influencing purchasing decisions. Natural colour technologies now provide options that are stable, concentrated, and visually appealing, enabling brands to maintain product performance while meeting clean label expectations.

Ultimately, the demand for natural red shades reflects both consumer desire for healthier, more transparent products and the industry's need to balance functionality with sustainability and visual appeal. The latest innovations demonstrate that brands can achieve bold, eye catching colours without relying on synthetic additives, aligning with evolving consumer values and regulatory pressures.

<https://www.foodingredientsfirst.com/news/red-40-natural-color-alternatives-demand.html>

Cereal Report Shows Decade of Sugar Reduction and Fiber Gains Across Europe

The Ceereal report covering 2015 to 2025 highlights significant progress in the nutritional reformulation of European breakfast cereals.

Over the decade, average sugar content was reduced by 18%, while whole grain content increased by 23% and fibre by 21%. Children's cereals showed the most dramatic improvements, with whole grain rising by 47%, fibre by

84%, and sugar reduced by 30%. These changes were achieved through voluntary industry efforts rather than regulatory mandates.

The report also notes that 60% of cereals sold in 2025 were fortified with vitamins and minerals, reflecting broader industry trends toward nutrient fortification. This aligns with public health priorities, including the European Commission's 2025 Safe Hearts Plan, which has intensified reformulation pressure across the food sector.

Ceereal emphasizes that these

shifts demonstrate the industry's long-term commitment to innovation and public health, balancing consumer demand for enjoyable products with improved nutritional profiles. Breakfast cereals are positioned as an important vehicle for delivering essential nutrients across age groups, particularly through fortification and reformulation strategies that reduce sugar while increasing fiber and whole grain content.

<https://www.foodingredientsfirst.com/news/european-cereal-fortification-reformulation-sugar-reduction.html>

Australian Rare Sugars Project Targets High-Value F&B Sweetener Opportunity

Researchers at the University of Queensland are advancing a project to produce low calorie rare sugars from cane

syrup using fermentation and engineered microbial "cell factories."

The initiative, housed at the newly launched UQ

Biosustainability Hub, aims to create sugar alternatives that retain the sweetness, texture, and baking performance of table sugar while offering fewer calories. Rare sugars, naturally occurring in some fruits, are increasingly valued by the food and beverage industry as healthier sweeteners, but high production costs have limited their adoption.

The team, led by Dr. Axayacatl Gonzalez and supported by Dr. Nathan Zhong, has engineered bacterial metabolism to convert cane syrup into rare sugars, building a library of strains capable of producing

different molecules in custom bioreactors. The project is part of Australia's AUD 370 million Trailblazer Universities Program and runs until 2027, in collaboration with MSF Sugar.

Australia, one of the world's largest sugar exporters, sees rare sugars as a high value opportunity to diversify its sugar industry and remain competitive globally. The approach could support the development of soft drinks and foods that deliver sugar like taste with fewer calories, aligning with consumer trends as nearly three quarters of people actively reduce sugar intake.

The Biosustainability Hub, a US 70 million facility, underscores the role of national research infrastructure in translating bioscience into commercial food ingredients. Federal officials emphasize that the hub provides both advanced equipment and expertise to accelerate innovation, positioning rare sugars as a potential health focused and economically valuable commodity for Australia's food sector.

<https://www.foodingredientsfirst.com/news/rare-sugars-fermentation-cane-syrup-ug-australia.html>



China Moves to Rein in Livestream Ads with New Draft Rules

China's State Administration for Market Regulation (SAMR) has drafted new rules aimed at tightening oversight of advertising in livestream commerce, a sector that has rapidly expanded as consumers increasingly purchase products through online streaming platforms.

The draft regulations place greater responsibility on livestream platforms to ensure compliance with advertising

standards, particularly in the promotion of health foods, which have become a major category in this space.

The move reflects growing concerns about misleading claims and inadequate regulation in livestream shopping, where influencers and hosts often promote products directly to large audiences. SAMR's initiative is part of a broader effort to safeguard consumer interests and maintain trust in digital commerce, especially as livestreaming continues to reshape retail in China.

The draft rules signal a shift

toward stricter accountability, requiring platforms to monitor and regulate advertising content more closely. This development comes amid the booming popularity of livestream shopping, which has become a central feature of China's e-commerce landscape, blending entertainment with retail and driving significant sales growth. The regulatory push underscores the government's intent to balance innovation in digital commerce with consumer protection and market integrity.

<https://www.nutraingredients.com/Article/2026/06/01/chinese-regulator-drafts-new-ad-rules-amid-livestream-commerce-boom/>



FSANZ Proposes Minimum Vitamin D Levels, New Labelling Rules for Toddler Milk

Food Standards Australia New Zealand (FSANZ) has proposed new regulations for toddler milk, aiming to strengthen

compositional requirements and labelling standards.

The proposal introduces a minimum vitamin D level of 0.36 µg/100 kJ, aligned with CODEX standards, where previously no minimum was prescribed. Current products in Australia and New Zealand range between 0.17–0.48 g/100

kJ, meaning many would require reformulation to meet the new threshold.

The name of toddler milk products will be standardized as "Formulated supplementary milk drink for young children," which must appear on the front of packaging. Nutrition content and health claims will be

prohibited, and products must be clearly differentiated from infant formula, follow-on formula, and other foods through text, imagery, or colour. FSANZ emphasizes that toddler milk is a “special purpose food” intended to supplement diets where energy or nutrient intake may be inadequate, not a routine dietary staple.

Protein sources will also be regulated, with permitted options including cow, goat, and sheep milk, soy protein

isolate, and partially hydrolysed protein. This move responds to safety concerns around novel protein sources and aligns toddler milk requirements with those of infant formula, ensuring nutritional adequacy and manufacturing consistency.

While reformulation and label adjustments will be necessary, FSANZ argues that the changes will benefit industry through international harmonization, manufacturing efficiencies, and alignment with CODEX standards, which prescribe

vitamin D ranges between 0.36–1.1 µg/100 kJ. The regulator has opened public consultation on the proposal, which will close on July 7, and highlighted that the framework is designed to improve consumer information, reduce confusion, and support safe use of toddler milk.

<https://www.nutraingredients.com/Article/2026/05/27/vitamin-d-minimum-levels-new-labelling-rules-proposed-for-toddler-milk-in-anz/>

South Korea on ‘Unfair’ Online Ads: Helping Food Firms Avoid Snags

South Korea's Ministry of Food and Drug Safety (MFDS) has released a comprehensive 78 page handbook to regulate unfair online advertising in the food sector, reflecting growing concerns about misleading claims in digital commerce.

The handbook defines what constitutes “unfair” advertising and provides clear guidance for food firms to avoid regulatory violations.

The move comes after two years of inspections that uncovered hundreds of cases where food products were promoted with false or exaggerated health claims, such

as promises of height growth in children or diabetes prevention. MFDS stressed that one of the most critical rules is ensuring that non approved products are not marketed as health

functional foods (HFFs). In South Korea, HFFs are strictly regulated under the Health Functional Food Act and must carry official certification marks for approved functions like immunity or digestion. Any product that misleads consumers into believing it is an HFF without approval is considered unfair advertising.

The handbook also addresses deceptive marketing tactics, including the use of testimonials, letters of appreciation, vague terms like “special method” or “Korean medicine,” and endorsements from health professionals or academics. Comparative

advertising that disparages competitors without objective evidence, as well as ads containing obscene language or links to gambling, are also prohibited.

MFDS has emphasized that the handbook is designed to help food companies understand exactly what statements and labels are banned, reducing consumer confusion and ensuring fair competition. The initiative complements earlier regulatory revisions that introduced AI driven inspections to strengthen oversight of online food sales, underscoring South Korea's commitment to consumer protection in the rapidly expanding digital marketplace.

<https://www.foodnavigator.com/Article/2026/05/27/south-korea-on-unfair-online-ads-helping-food-firms-avoid-snags/>

FDA Clears Key Hurdle for Animal-Free Dairy Protein

Formo and Those Vegan Cowboys have reached a significant milestone in bringing animal-free dairy

proteins to the U.S. market.

The FDA has acknowledged Formo's GRAS (Generally Recognized as Safe) notice for recombinant αS1-casein, registered as GRN 1312,

which is the final step before the agency may issue a “no-questions” letter. Such a letter would effectively clear the ingredient for use in food products.

Casein is considered the backbone of dairy because it

provides texture, melt, stretch, emulsification, and gelation. Formo argues that its precision-fermented recombinant casein can outperform animal-derived casein in various applications, while also being lactose-free, hormone-free, and traceable. This makes it suitable for consumers with lactose intolerance and those seeking clean-label, animal-free alternatives.

The ingredient was developed in collaboration with Those

Vegan Cowboys, a European food-tech startup that produces milk proteins without animals using what it calls a “stainless steel cow.” Together, the companies have aimed to accelerate regulatory approval and reduce development costs. While they remain competitors in the recombinant casein space, Formo will now advance independently with its biotech platform, focusing on customized casein variants for next-generation food and nutrition.

This regulatory progress positions recombinant casein as a potential disruptor in the trillion-dollar dairy market, opening opportunities for new products such as cheese, chocolate, and sports nutrition formulations that deliver the functional benefits of dairy without relying on animals.

<https://www.foodnavigator.com/Article/2026/06/02/precision-fermented-casein-from-formo-advances-toward-us-market-after-fda-gras/>

Regulators Clamp Down on Vitamin B6 As Toxicity Debate Grows

Regulators worldwide are tightening oversight of vitamin B6 supplements as concerns grow about potential toxicity from excessive intake.

While vitamin B6 is essential for human health, high doses have been linked to serious side effects, prompting authorities to reassess safety thresholds.

The debate centres on whether current restrictions are proportionate to the risks. Some countries have already taken

strong measures: Australia has announced that from June 2027 vitamin B6 will be available only under a pharmacist only scheme, while Singapore's Health Sciences Authority previously required warning labels against excessive intake. The European Union is also moving toward harmonized limits for vitamins and minerals.

The NutraIngredients report notes that regulators are particularly focused on preventing consumers from mistakenly believing that higher doses equate to greater benefits. The new clampdown reflects a broader trend of stricter regulation in the supplement industry, aimed at balancing consumer access with public health protection.

<https://www.nutraingredients.com/Article/2026/06/08/regulators-clamp-down-on-vitamin-b6-supplements-as-toxicity-debate-grows/>

Pea Protein Enzyme at Bridge2Food Designed to Cut Off-Notes Without Reformulation

Amano Enzyme introduced its latest innovation, ProBoost Neutra, at Bridge2Food Europe 2026 in Copenhagen, presenting it as a solution to two major challenges in pea protein applications: poor solubility and undesirable flavour notes.

The enzyme is designed to enhance emulsification and solubility of pea protein isolate

while reducing off-notes, all without compromising protein content. A key advantage is that it can be integrated into existing wet fractionation lines,

eliminating the need for costly new infrastructure and replacing the traditional alkaline step with a cleaner, organic-compliant process.

Antonio Sullo, Ph.D., Head of R&D at Amano Enzyme Europe, highlighted the enzyme's potential in applications such as boosting protein levels in pea-

based cheeses and converting pea starch fractions into low-sugar syrup, offering alternatives to chemical or thermal methods. The company emphasized that ProBoost Neutra is non-GMO and organic-compliant, aligning with industry demand for cleaner processing solutions.

This launch builds on Amano's earlier work in plant proteins, including the 2021 introduction of Umamizyme Pulse, which was developed to create umami and kokumi flavour profiles in pea, soy, and rice proteins for meat alternatives and savoury foods.

Sullo underscored that pea protein remains central to plant-based innovation but continues to pose challenges in taste, texture, and

performance. ProBoost Neutra was developed to address these barriers and open new opportunities for manufacturers to deliver products that better

meet consumer expectations.

<https://vegconomist.com/fairs-events/amano-enzyme-unveils-pea-protein-enzyme-bridge2food-designed-cut-off-notes-without-reformulation/>

Fed Up! campaign takes aim at UPFs, but the science debate persists

The Fed Up! campaign has emerged as a science-driven initiative to confront ultra-processed foods (UPFs), framing them as a systemic issue rather than a matter of individual choice.

It argues that UPFs—engineered to be hyper-palatable, cheap, and pervasive—are linked to increased risks of chronic diseases such as heart disease, cancer, depression, metabolic disorders, and premature mortality.

The campaign's mission is to translate peer-reviewed, conflict-free research into accessible education, empower consumers without guilt, and mobilize systemic change.

Food scientists, however, stress that the debate is hindered by the absence of a clear, universally accepted definition of UPFs. Anna Rosales of the Institute of Food Technologists highlights that current classifications often conflate processing methods with formulation, leading to

confusion and inconsistent categorization.

Kantha Shelke of Corvus Blue adds that researchers often disagree on what qualifies as UPF, with consensus reached only about a third of the time.

Both point to the limitations of the NOVA classification system, which lumps together foods with vastly different health impacts, such as soda and fortified bread, and portrays industrial processing negatively compared to home preparation.

Experts emphasize that food processing itself has historically improved safety, nutrition, and accessibility, preventing deficiencies and reducing foodborne illness.

They caution against equating “processed” with “harmful,” noting that fortified and reformulated products can play beneficial roles. The debate also intersects with socioeconomic realities, as lower-income households rely heavily on packaged, shelf-

stable foods.

Messaging that stigmatizes processing risks alienating or shaming those who depend on affordable fortified products.

Industry voices, such as the Consumer Brands Association, underscore that the U.S. food system is among the safest globally, regulated by rigorous FDA standards.

They acknowledge the importance of nutrition debates but insist that food safety is not in question. Innovation in reformulation—reducing sodium and sugar, increasing fibre, and adding beneficial nutrients—further complicates broad UPF categorization.

Despite differences, there is alignment on several points: the need for scientific rigor, clearer definitions, and improved consumer understanding.

Both advocates and sceptics recognize that confusion around UPFs undermines public trust and effective policy.

The Fed Up! campaign and food science experts converge on the importance of evidence-based approaches, even as they diverge on how UPFs should be classified and addressed.

<https://www.foodnavigator.com/Article/2026/06/15/fed-up-campaign-highlights-divide-over-ultra-processed-foods/>

Indonesian FDA Launches Initiative to Help Local Herbal Firms In NPD, Export

The Indonesian Food and Drug Authority (BPOM) has launched a new initiative called BRIDGE (Synergy in Globally Competitive Innovative Research and Market Expansion) to strengthen the country's herbal and botanical sector.

The program connects local businesses with researchers to develop innovative products based on native botanicals, aiming not only to serve the domestic market but also to position Indonesia as a global leader in traditional herbal medicine, particularly Jamu.

Jamu, recognized by UNESCO in 2023 as an Intangible Cultural Heritage of Humanity, is a

centuries-old system of herbal remedies that remains central to Indonesian culture and health practices.

BRIDGE is designed to help micro, small, and medium enterprises (MSMEs), which make up over 60% of Indonesia's GDP

and 97% of employment, overcome challenges such as limited capital, lack of access to advanced research tools, and difficulties in meeting Good Traditional Medicine Manufacturing Practices.

To support these businesses, BPOM has introduced the PUSAKA reference book, a compendium of active substances that provides a scientific foundation for product development and reduces the cost of evidence generation.

The initiative also creates a pathway for MSMEs to advance from traditional Jamu products to standardized herbal

medicines and eventually phytopharmaceuticals, enabling stronger evidence-based health claims and integration into hospital formularies and national health insurance.

Examples of innovation include gummies made from moringa leaves and dragon fruit peel, frangipani-based body scrubs, and cinnamon cookies, all showcasing the potential of Indonesia's rich botanical resources.

With approximately 31,000 plant species across the archipelago and thousands already used in traditional medicine, BPOM sees enormous potential for Indonesia to become globally recognized for its herbal products.

By bridging the gap between research and commercialization, BRIDGE aims to transform local innovations into competitive exports, while reinforcing Jamu's cultural and scientific significance in the modern health landscape.

<https://www.nutraingredients.com/Article/2026/06/23/indonesian-fda-launches-initiative-to-help-local-herbal-firms-in-npd-export/>