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PROCESSING OF FOODS HELPS REDUCE PESTICIDE RESIDUES

Processing has been given a bad name. Initially, it was only the activists and influencers but now the scientists have joined the bandwagon without applying the science involved.

There are many studies, mostly epidemiological ones, that try to show the processed foods in bad light.

Yes, not all processed foods are very healthy and some may have to be consumed in limited quantities to avoid excess of calories or other undesirable side-effects. However, this is true of home cooked foods also. And that does not mean that all processed foods are bad.

Many studies have been reported showing that processing destroys some essential nutrients. So does home cooking and actually many of the operations such as pasteurization, high-temperature-short-time or ultra-high-temperature processing causes much less losses than heating or boiling at home. That also does not mean that all processed foods cause less damage to vitamins. Home cooking has many advantages such as making the foods the way individual families like and prefer that are not considered in processing industrially.

Still there are many advantages of processed ingredients and food products prepared in modern processing plants that must be appreciated than just trying find faults with it to give industry a bad name.

Roller flour mills produce refined flours. There are many different types for different flours and even for different grades of same flour. Most remove the outer covering to separate the edible kernels from chaff, hulls etc. This unfortunately also removes bran that contains dietary fibre and many minerals and vitamins. It has been shown that agricultural chemicals like pesticides, herbicides etc. that accumulate commonly in the outer layers of grains, including bran, are largely removed by preparing refined flour.

There are many heat processes that are known to reduce the chemicals used in farms. Many other processes, such as washing, peeling, soaking etc. that could also be done at home levels, show marked reduction in such chemicals. Refined edible oils are prepared primarily to reduce the free fatty acids that lowers the quality of oils. It also removes the odours of native oils, which are preferred by some but disliked by others.

Unfortunately, there are losses of some vitamins and healthy components during refining. However, there is substantial removal of harmful chemicals used during cultivation of these crops.

There is a need to reduce the application of harmful chemicals in agricultural practices, but when these are unavoidably used to prevent the losses of crops, their removal by refining or processing should be appreciated. We can always add back many of the nutrients lost by enrichment and make the products more nutritious by fortification, rather than harping on their losses and advocating against processing or refining.

Prof Jagadish Pai, Editor, PFNDAI

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100% FRUIT JUICE: FINDING GROUNDS IT'S MISLEADING

AUTHOR

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

FSSAI instructed businesses to remove the 100% fruit juice claim from labels, as (a) there is no provision to make the claim; (b) the claim 100% is misleading, as (1) the major ingredient of fruit juice is "actually" water, and the "ingredient (fruit)"is only present in limited concentrations:(2) fruit juice is reconstituted using water and concentrate/pulp.

The grounds for noncompliance to specific clause(s) in the referenced regulations are not stated. Statement (b1) is a remarkable display of not knowing basic food compositions. Fruit juices expressed from fruit are innately composed of water, not made up. Milk is 85-89% water with 11-15% solids: it is not an ingredient (milk) made with water as a major ingredient. Miscommunicating facts is a flashpoint for social media to discredit the food industry, and regulators should communicate properly. Juices less influenced by seasonal variations meet consumer expectations on taste and feelings of freshness served in ready-to-drink packs -not reconstituted at consumption- but already done before sale.

Indian regulations are complex and disjointed, and unravelling them is not easy. Juices are primarily regulated by a statement of identity (or a reserved name) with clear descriptions and enforceable standards of identity. FSS 2.3.6 describes fruit juice as being expressed directly from the fruit or "concentrated and later reconstituted" with water suitable for maintaining the basic composition and quality. It must pass the minimum 0Brix value to meet the essential composition criteria. Beverages containing less than 100% juice, such as nectars (40% juice), cordials (25% juice), or drinks (not less than 10% juice) are also available.

Declaring 100% in the name of the food concerns labelling, so no provision is made in the advertisements and claims regulation. In the labelling and display regulation, 5.2(f)refers to listing ingredients in descending order by weight when reconstituting dehydrated or condensed foods prepared for consumption as given in 5(13) instructions for use: both inapplicable to this case.

In the US, beverages that purport to contain juices (fruit or vegetable) must make a percentage declaration. Juices directly expressed from fruit or vegetable must declare, for example, 'contains 100% orange juice' or '100% orange juice'. When reconstituted from concentrate, the US FDA considers it 100% juice according to Brix concentration representative of the originally expressed juice listed in the standard. Under similar Brix testing protocols, we would declare them 'genuine'. Conversationally, 100% juice distinguishes what the consumer expects better than technical terms, nectar, drink, beverages, squashes and cordials.

Labelling regulations, however, discourage descriptions that are false, misleading, deceptive or likely to create an erroneous impression regarding the character of the food in any respect or conflict with them. Following its advice to FDAs, the Authority should have served Improvement Notices (IN) u/s 32 for minor labelling offences, giving specific grounds for noncompliance. If, at its face value, a simpler way of differentiating beverages to consumers is available and the product genuinely complies, grounds for believing intent to mislead should be stated. Knowing precisely how regulations prevent, restrict, or permit builds a credible compliance system.

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PROCESSING AND ITS EFFECT ON THE NUTRITIONAL INTEGRITY OF FOOD (PART 1)

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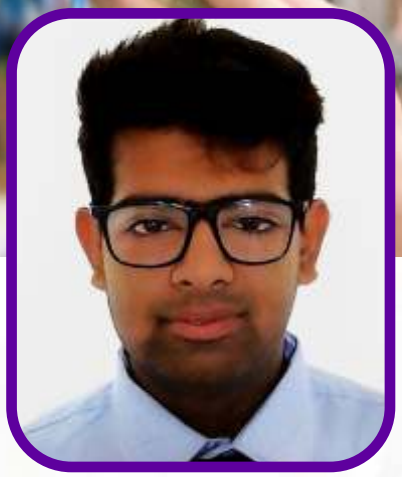


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Abstract:

Food processing is a tried-and-true method of improving food's availability, shelf life, and nutritional value. This paper examines the complex effects of food processing on nutritional quality, emphasizing advantages including increased food safety, nutrient bioavailability, and extended storage capacity. It explores related disadvantages at the same time, such as nutrient loss and the production of undesirable chemicals. The article also highlights how innovations such as digital technologies, cross-sector collaborations, and evolving consumer behaviours support the role of food processing in advancing sustainable development goals. Emerging initiatives, like efforts to reduce sugar and salt, underscore the global movement toward more sustainable and healthier food systems. The paper offers a thorough understanding of how food processing still influences lifestyles by examining economic, health, environmental, and social aspects.

Keywords: Food Processing, Nutrition, Food Safety, consumer behaviors, digital technologies, Food Systems

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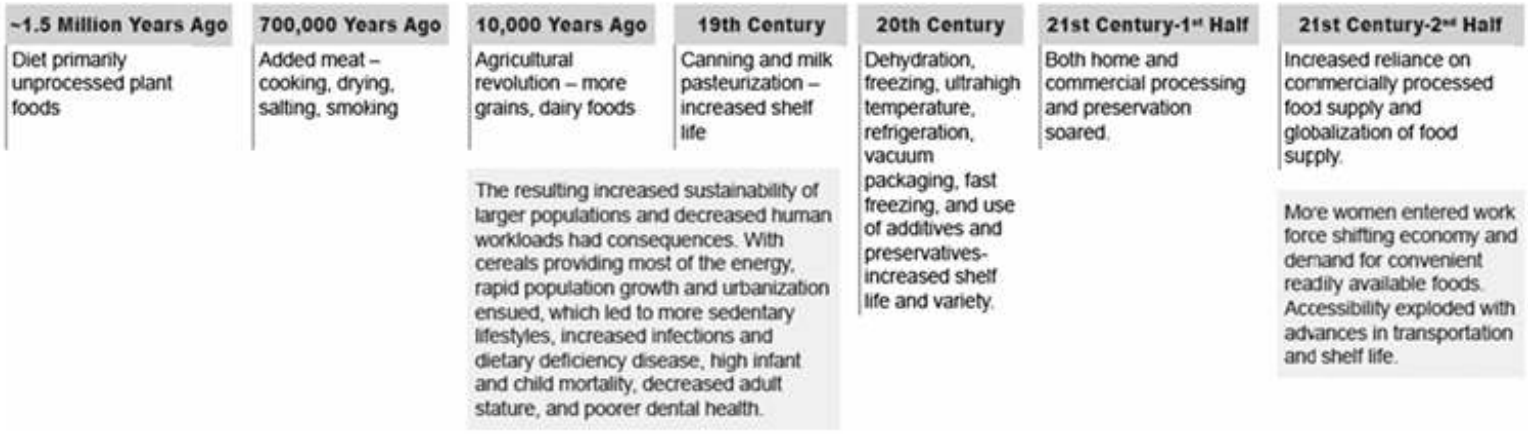


Figure 1: Evolution of Food Processing through ages [2]

Introduction

Food processing is a prehistoric practice that was conducted to enhance food according to demand and needs. It can be best defined as altering foods from the state in which they are harvested or raised to better preserve them and feed consumers.

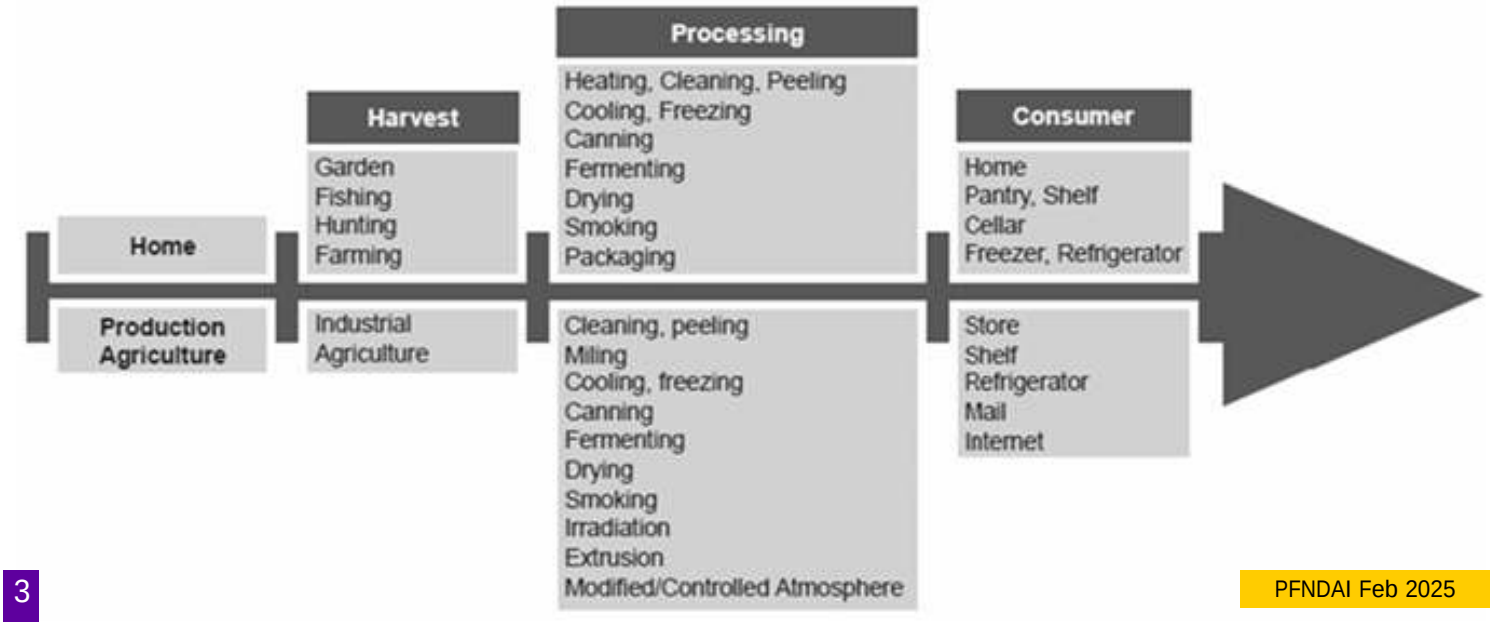
In simpler words, it is a technique of manufacturing and effectively preserving food substances to enhance their shelf life; improve quality as well as make it more useful.

As said, a prehistoric practice that is still followed is as shown in Figure 1.

Based on processing levels, there are three distinct segments: Sorting, grading, and packaging fruits, vegetables, milk, rice, spices, and other foods are all part of primary food processing. Food that has been reshaped for ease of ingestion is considered secondary processing. It contains things like flour, oil cakes, powdered tea leaves, and beverages. The value added food segment, also known as Tertiary Processing of Food, comprises processed fruits and vegetables, juices, jams, and jellies, among other products
[1]

Figure 2, explains some of the basic preservation and processing of food were done at home and at the industrial scale and their consequences on food quality, nourishment, and safety are largely the same, however, regardless of whether food is processed at home or commercially.

Figure 2: Basic processing of food at home or at factories



Food components are altered throughout processing, and depending on the method, some of these modifications may improve or worsen the quality of the final product.

The elimination of food-borne pathogens and pollutants, increased nutritional bioavailability, prolonged shelf life, and improved sensory and functional qualities are a few advantages of food processing. Despite this, numerous papers on the drawbacks of food processing have concentrated on problems like the damaging impact of heat treatment on food quality.

The use of additives to improve food safety, shelf life, and quality (such as taste and appearance) is also included in food processing. One crucial component of food security is the management of threats to food stability and safety, which can only be accomplished through regulation.

Types of Process and its effects on nutrition:

(a) Traditional food processes:

To increase the bioavailability of micronutrients in plant-based diets, households can employ a number of conventional food processing and preparation techniques. These techniques include soaking, fermentation, germination/malting, mechanical processing, and heat processing[3].

(b) Emerging new Processes:

New and developing food processing technologies have been investigated as ways to alter material qualities and prolong food shelf life, including high-pressure processing (HPP), cold plasma, pulsed electric field (PEF), UV irradiation, and ultrasound. Although conventional food processing will remain important in supplying people with food, it is also expected that the use of these technologies to enhance food quality will grow[4].

Effects and Contribution:

Role in Human health and Lifestyle

Processed foods have always been a controversial option for consumption, but they are unarguably an important component of the food supply and nutrient security. The effect on bioavailability has also been studied, such as starch, which is obtained from the processing of grains into flour and subsequent incorporation into bread.
Also, shelf-life improvement enhanced the safety of meat achieved through refrigeration and cooking, improved the safety of milk achieved through pasteurization, and year-round availability of seasonal fruits and vegetables achieved through preservation, canning, and freezing[4]

A certain change in lifestyle has been in trend, Strategies to reduce sugar and salt in food intake. Thus, upcoming concepts of reduced sugar and salt in processed food not only fulfill the demand but also have a significant impact on reducing non-communicable diseases [5]. FSSAI had also launched a eat right movement in order to reduce the consumption high fat, high sugar and high salt.

Some global trends have also been accounted for: Several countries in Europe, the Americas, and the Western Pacific Region that have introduced salt reduction programs have reported reductions in salt levels in one or more food categories [6]. In Australia salt levels in bread were estimated to be reduced by 9%, in cereals by 25%, and in processed meat by 8% [7]

Role in Sustainable Development Goals:

Gaining a comprehensive understanding of the interconnections and dynamics between food systems, value chains, food processing, and SDGs is vital for identifying impactful opportunities for improvement. To ensure the continuous improvement of food systems' sustainability, it is crucial to monitor efforts and initiatives using widely accepted indicators that effectively measure progress towards the SDGs. Whenever possible, scientifically validated methodologies should be employed to assist food producers, regulators, consumers, and other stakeholders in identifying significant food production and processing practices that drive positive transformations toward sustainable food systems.

Certain aspects holistically contribute towards Sustainable goals:

(a) Digital technologies: In order to manage trade-offs and enhance the management of food value chains, digital technologies such sensor systems, data acquisition and management technologies, machine learning, artificial intelligence, and blockchain technology will be crucial [8]. Many of these applications usually have a limited scope, focussing on solving a single issue or improving a particular area of the food production process as a whole. Despite all of their advantages, there are a number of challenges with the use of digital tools that need to be resolved. Cost is a significant obstacle that small and medium-sized businesses may find prohibitive [9]

(b) Consumer behaviour

Since people's choices and preferences directly affect both their own nutritional intake and the food system's environmental effect, consumer behaviours are crucial to shift towards more sustainable food systems. Because of the public's ignorance about modern food production, false beliefs have emerged that may skew a fair assessment of the benefits of food production. These days, words like "ultra-processed" food are used to describe factory-made and low-quality food, both of which have negative connotations [10][11].

Concerns about safety, health, and sustainability must be addressed in order to foster consumer trust in food systems, which is essential for advancing sustainability and the adoption of cutting-edge technologies. By doing so, we can establish a solid foundation for maintaining consumer confidence, encouraging their active participation to ensure the long-term health of our food systems.

(c) Cross-sector collaborations

The entire food system must undergo substantial changes in order to achieve more sustainable food systems. For this to happen, —governments, corporations, scientists, civil society organisations, and consumers must work together and take appropriate action [12]. Innovative strategies like the BATWOVE model are necessary to unite these groups and reach an agreement: Recipients of the suggested change, The actors who ought to transform, changes that specify which input is converted to which output, viewpoints on the world, Owners who possess the authority to halt the change, victims who suffer as a result of the change and environmental limitations [13]

Effect of processing on Economics:

A study [14], discussed the demand for food, production and supply costs, and the competitive dynamics within the industry are key economic factors shaping the food processing sector. This study examines the trends in these economic forces over the past 30 years, offering insights that could be valuable for future managerial decision-making.

Another study [15], The paper analyses the growth and financial performance of key food-processing industries, including food grain milling, edible oilseed processing, sugarcane processing, and milk processing, all of which produce widely consumed products. It prioritizes these industries for development based on performance metrics and outlines strategic approaches.

Another case study [16] examines the effect of supply chain pressures on the UK food processing industry and its implications for occupational health and safety is explored. Through case studies at three meat processing plants, the research reveals that while accident rates are decreasing, significant progress has yet to be made in addressing the widespread health issues linked to repetitive and, in some cases, physically demanding work practices. Supermarkets play a conflicting role: they encourage improvements in health and safety but simultaneously, their price and delivery demands, negatively affect the industry.

Government Policies

The Ministry of Food Processing Industries has launched a human resource development (HRD) program focused on the food processing sector. This program is being executed in partnership with State Governments under the National Mission on Food Processing. It includes four key components:

• Development of infrastructure for degree and diploma programs in food processing.
• Entrepreneurship Development Program (EDP).
• Food Processing Training Centers (FPTC).
• Training opportunities at accredited institutions at both the State and National levels."

The Food Safety and Standards Authority of India (FSSAI), under the Ministry of Health and Family Welfare, has introduced the Food Safety and Standards (Food Product Standards and Food Additives) Regulations, 2011, and the Food Safety and Standards (Contaminants, Toxins, and Residues) Regulations, 2011. These regulations set out the relevant safety and quality criteria for food products [1].

New initiatives introduced by the Ministry of Food Processing Industries are expected to boost agro-processed food exports and increase farmer incomes, contributing to the growth of the food processing sector. Furthermore, the government has approved the creation of five Mega Food Parks in Bihar, Maharashtra, Himachal Pradesh, and Chhattisgarh [1].

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THE SCIENCE OF PROTEIN: ENSURING HIGH-QUALITY NUTRITIONAL SOLUTIONS

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Protein is a vital nutrient, which supports growth, maintenance and various physiological functions of the human body. While protein quantity is often emphasized, the importance of protein quality is less frequently discussed or even completely ignored.

Data from India suggests that 60% of the protein intake is from cereals, which has lower digestibility and quality. The protein intake of population from rural, slums and tribal is estimated to be about 1 g /kg/ day (mainly from cereals), however when corrected using the digestibility scores, this seems to be inadequate protein intake in terms of quality[1]. It is estimated that 4% and 26% of population in different age group (urban and rural) are at the risk of quality protein intake deficiency. Hence, to overcome these challenges, complementing cereal protein with legumes, milk etc. is important[2].

This article sheds light on methods for estimating protein quality and explores ways to enhance it while innovating and developing nutritional food products.

Amino acids are the building blocks of protein and are classified into Dispensable amino acids (DAAs) and Indispensable Amino acids (IAAs)or Essential amino acids based on whether the body could synthesize the particular amino acid. There are nine essential amino acids, which cannot be synthesised by the human body and should be supplied by the diet.

In certain medical conditions some DAA like arginine, glutamine etc. becomes conditionally essential amino acids, hence should be supplied by the diet to compensate for reduced synthesis during that stage[3].

Sources of protein includes legumes, pulses, cereals, nuts, dairy products like milk, curd, paneer, and other animal proteins like chicken, fish, egg etc. Plant proteins, mainly found in cereals, pulses, legumes and vegetables are often limiting in one or more of the IAA and have lower digestibility. E.g., Cereal proteins lack lysine and pulse contains low amount of sulphur containing amino acid like methionine. When both cereals and pulses are combined in right ratio, these can complement each other, supplying the missing amino acids3. While the digestibility of plant protein is a challenge, and one should focus on methods to increasing its digestibility. On the other hand, animal protein including milk, egg etc. have high digestibility, contain all nine essential amino acids, and are hence sometime called complete proteins.

Understanding the protein quality is thus crucial because it ensures that the diet provides all essential amino acids for optimal growth and maintenance. The principle used to express protein quality has three basic elements3: **

1) Amino acid composition
2) Digestibility of the IAAs
3) IAA requirements of the target population.

Protein digestibility–corrected amino acid score (PDCAAS)4 is one of the commonly used methods for determining protein quality in human nutrition. This method compares the concentration of first limiting amino acid in the test protein (corrected for its faecal digestibility) against the corresponding amino acid in a reference. IAA requirements of the preschool – aged children are used for the scoring pattern. However, there are a few concerns, which have been raised for PDCAAS:

1.Validity of the preschool children amino acid requirement as the standard, as this may not reflect the dietary need of older children, adult etc.
2. Use of faecal digestibility instead of ileal digestibility as the conclusions are based on what is excreted rather than what gets absorbed.
3. Truncation of PDCAAS values to 100%. When the values are truncated to 100% this does not allow to give extra recognition to nutritional value of high-quality proteins such as animal protein or carefully blended protein from diverse plant, microbial and animal sources.

PDCAAS(%) =mg of limiting amino acid in 1g of test protein mg of same amino acid in 1g of reference protein × fecal true digestibility (%)×100

Hence, FAO now recommends replacing the PDCAAS with the new scoring system termed the digestible IAA score (DIAAS)** which addresses the limitations of the PDCAAS[5].

Rather than using single faecal crude protein digestibility value DIAAS uses true ileal amino acid digestibility for the dietary indispensable amino acids

- The reference amino acid scoring patterns that can be used for calculating DIAAS are as follows[6]:

➢ Infants (birth to 6 months), pattern of breast milk
➢ Young children (6 months to 3 y), pattern for the 0.5 y old infant

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- Older children, adolescents and adult
- Digestibility is defined as a portion of ingested protein, which is available for absorption. In DIAAS, pig models have been used, since the digestive physiology is very similar to humans[5].

DIAAS for both single protein and mixed meals can be calculated using below formula:

DIAAS6= 100 x lowest value [(mg of digestible dietary indispensable amino acid in 1 g of the dietary protein)/(mg of the same dietary indispensable amino acid in 1g of the reference protein)]

A DIAAS score of 100 indicates that the protein is of excellent quality, and can help meet the protein requirements of the particular age group[5]. Further, FAO report recommends classifying protein quality as6:

- <75 no quality claim,
- 75- 99 high quality protein and
- >100 excellent quality protein.

It is also important to note that, Protein utilization and deposition is dependent on intake of adequate energy from carbohydrates and fat and micronutrients. Protein intake alone cannot increase muscle protein deposition in the absence of exercise. It is to be noted that DIAAS method does have the limitation of using swine models, which may not always be useful in extrapolation to humans. As formulators, when we develop products with high protein content, ensuring the protein quality becomes equally important. Here are some of the ways to increase the protein quality in food products ensuring the protein is digestible, available and nutritionally complete.

1. Select high quality protein sources: Choose protein sources with a high DIAAS score, such as milk-based protein, soy protein etc. These sources are known for their excellent amino acid profile and digestibility.
2. Optimize protein blend: Combine different protein sources to achieve a balanced amino acid profile. This helps ensure that all essential amino acids are present in adequate amounts. If you are using plant protein, ensure the combination of proteins has complementing effect giving an overall high-quality formulation. E.g. Pea has a DIAAS of 70 (Using reference amino acid scoring pattern for 0.5 to 3 yrs. old children) while a combination of pea, wheat and Soy (In the ratio of 25:20:55) will increase the DIAAS to 90.7
3. Protein digestibility studies: Focus on ways and means to increase the protein digestibility. Check the feasibility of conducting digestibility studies or explore models to measure the actual digestibility of the finished product.
4. Minimize anti nutritional factors: like saponins, tannins, phytic acid, protease inhibitors etc. that may interfere with protein digestibility, thereby affecting its bioavailability.
5. Processing techniques: certain techniques like fermentation, extrusion, and hydrolysis can help to increase protein digestibility and bioavailability.
6. Enzyme supplementation: One may consider to addition of digestive enzymes like proteases, which may help enhance the digestibility of the protein, making it easier for the body to absorb the amino acids.
7. Probiotics: Certain strains of probiotics have been studied to aid in protein absorption.

DIAAS values of different food items have been compiled in the table below. It is to be noted that scores of any blends of the food items mentioned have to be assessed in order to be accurate.

Table: DIAAS calculated using the recommended amino acid scoring pattern for children older than 3 years, adolescents and adults

Food Items	DIAAS
Whey protein isolate^	125 (histidine)
Whey Protein concentrate^	133 (histidine)
Milk protein concentrate^	141 (SAA)
Skim milk Powder^	123 (SAA)
Pea protein concentrate^	73 (SAA)
Soya protein isolate^	98 (SAA)
Wheat^	54 (lysine)
Egg^^	122 (SAA)
Mung beans (cooked)^^	94 (Threonine)
Chickpeas (cooked)^^	71 (Valine)
Kidney beans (cooked)^^	71 (Valine)
Quick oats^^	67 lysine
Polished white rice^^	64 lysine
Dehulled barley^^	51 lysine

SAA =Sulphur amino acids (methionine + cysteine).
^British Journal of Nutrition (2017), 117, 490–499
^^ Adhikari et al. Protein Quality in Perspective: A Review of Protein Quality Metrics and Their Applications. Nutrients. 2022 Feb 23;14(5):947. (doi: 10.3390/nu14050947)

Conclusion:

By understanding protein quality, combining different protein sources, we can achieve good protein bioavailability and develop innovative formulations to address the specific protein deficiencies. Thus prioritizing protein quality in food products is equally if not more important than simply focusing on the quantity.

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DIETARY FIBRE – HOW TO GET ENOUGH IN MODERN DIET:

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Indians used to get enough of dietary fibre earlier but as our diet changed, both home cooked and prepared food that we consume, our intake of dietary fibre has been declining and now we need to again consciously make effort to get enough of it for proper healthy diet.

We used to consume millets and other whole grains along with the kind of fruits and vegetables that would provide enough of dietary fibre. As we started eating more of wheat and rice, especially polished white rice instead of brown and parboiled and as we consume less of pulses and leafy vegetables, we started reducing our intake of dietary fibre. Among the important contributors in Indian diet are spices and when we shift to western cuisines, spices also get reduced, and the fibre intake is affected.

Fibres were considered roughage that were wastage after food was consumed. However, over the years many benefits became known such satiety and weight management, blood sugar control, gut health, and others so it was not only considered essential in our diet and even some benefits in reduction of certain diseases. Some newer applications can help develop healthier food products.

Studies have shown conclusively that dietary fibre would provide various advantages including health benefits and reduction of disease risk. Consumers are also getting aware of the importance of dietary fibre in our diet and that most are getting less than the desired amounts through diet.

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This results in various health benefits such as immune function, hormonal regulation and heart health. Insoluble fibre does not dissolve in water and remains relatively unchanged passing through the digestive system and help mainly to prevent constipation and help weight management by providing fullness after a meal.

Soluble fibre is found in oats, beans, peas, pulses, apples, guava, and citrus fruits. Insoluble fibre is present in whole grains, pulses, nuts and vegetables.

Ingredients Refined for a purpose

Earlier, most foods used to be prepared using whole ingredients such as whole grains and pulses. These contained good amounts of dietary fibre. However, during food preparation either fibre is removed or there are changes in fibre.

When refined wheat flour is made, bran is removed. Bran has good proportion of dietary fibre, so refined flour has less fibre compared to whole wheat flour. When pulses are converted to dal or pulse flour like besan, there is removal of the outer hull that contains not just dietary fibre but also some nutrients and anti-nutritional factors.

When bread is made elastic, gluten formed expands as gas produced by yeast cells during fermentation of dough. If bran is present, the expansion is disrupted, and a light fermented dough is not properly formed. This leads to bread becoming dense and chewy rather than fluffy and soft.

In many snacks like biscuits, cookies and extruded snacks, the texture is hard if there is too much dietary fibre in flour. So, dietary fibre causes some problems in making an acceptable product.

In fruit products such as juices, jellies and other products, the fibre may be removed by filtration. Fibre disrupts gel formation as well as it forms a cloudy appearance if not separated from particulate matter. So, the juices may be filtered to remove fibre or may be treated with enzymes to break it down to smaller molecules that are soluble, so theydo not cause problems in gel formation or in clarity.

Although there is a negative side to reducing dietary fibre in ingredients and food products, there is also a positive side. Dietary fibres are known to reduce the bioavailability of mineral nutrients from cereals. So, when they are removed by milling, although fibre may be reduced, bioavailability increases. Also, there are some anti-nutritional factors, such as oxalates and phytates in millets, that also reduce the bioavailability of minerals, especially iron. Milling to remove the bran and hull of cereals reduces these antinutritional factors, and flour becomes more nutritious.

Another problem that worries health professionals lately is agricultural chemicals like pesticides. These mostly reside in the outer bran portion, and thus, the removal also reduces these unsafe substances. Thus, there are both sides to the refining process.

How Processing Affects Fibre

There are several steps in the preparation of food at home or in a factory. All these steps affect the dietary fibre to a lesser or greater degree. Also, there are two sides that need to be considered to see if the food is better or worse. Some nutrients are lost during such minimal processes as cleaning, pruning, cutting, peeling, soaking, drying, extrusion, fermentation, cooking with heat or microwave that have been used both at home as well as in factories. Most steps in preparing the food will involve some losses of nutrients, but some steps like fermentation will gain nutrients, and almost all the steps will, to some extent, make the food safer and certainly more palatable. Even the homemakers will try to make the food as tasty as possible so their family members will be well-nourished.

The extrusion process was criticised in some guidelines for adverse effects on dietary fibre. However, it has been shown by studies that although the insoluble fibre may be reduced in content, the total and soluble fibre increases compared to original ingredients. Much of the effect is due to insoluble being converted to soluble, and there are some other intermolecular structure changes taking place. So, the total effect is, in fact, positive rather than negative as purported.

Similar changes have also been observed in high-pressure processes that increased the soluble fibre at the expense of the insoluble. Biological processes such as enzymatic and fermentation processes also cause similar changes by converting insoluble to soluble. However, here, one has to be careful not to hydrolyse the soluble fibre further to extremely small carbohydrates that would not have the dietary fibre properties and may be digested by human intestinal enzymes.

Dietary Fibre Improvement in Processed Cereals

As the refined ingredients lose dietary fibre in their preparation, these are sometimes added back. Addition could be done by using bran or other materials removed and further processed to remove undesirable components. Alternatively, ingredients and staples that are rich in dietary fibre could be added to elevate the refined or low-fibre flour. Millets, pulses, some seeds, etc., have been used. There are products with oats, quinoa and soya products available serving enriched or fortified with of both proteins and dietary fibre.

Besides the refined cereals flours that have lost dietary fibre, there are other foods which have inherently lower fibre content. Animal products have almost no fibre. Some fortification of such products from meat, fish, poultry and eggs as well as milk products could be beneficial. Many snacks like burgers, pizza and fingers etc. are promising ones for adding fibre from one of the above forms. Milk products, especially sweets, could be advantageously fortified with dietary fibre, especially the soluble one, so it may cause less problems with the processing and eating characteristics of sweets but also will control the blood glucose surge if one eats too much of such sweets.

AI Can Help Predict Fibre Contents in Packaged Foods

Estimation of fibre in food products is cumbersome. Earlier, only crude fibre was determined in proximate analysis but that left out soluble fibre, which is a bit difficult to determine. Many companies do not provide the dietary fibre in the nutrition information as it is not mandatory unless a claim is made on label. So, consumers do not get this information. One approach is the fibre estimation by calculations based on ingredient proportions. By predicting fibre in individual ingredients and then predicting overall fibre content would give the approximate content in the undeclared product.

Researchers from the University of New South Wales in Sydney have developed a method to predict dietary fibre content in commonly available packaged foods using machine learning. The algorithm developed considers fibre values of 8 most similar products to predict the products' fibre content. It has greater accuracy for products having higher fibre contents than the products having negligible fibre contents. It has been shown to have an advantage over the earlier prediction method based on individual ingredient estimation.

Innovative Ways for Fibre Improvements

There are various fibre containing ingredients available for preparing the food products high in fibre. As mentioned above, millets, pulses, fruits, vegetables and seeds & nuts as well as their various products, are sources of fibre. These may also bring in some other components that may change the sensory properties of food products. Some may also add nutrients.

Some fibre materials may be extracted from natural sources such as inulin, pectin, various gums like guar gum. These may be further treated to adjust their solubility, viscosity and other properties that affect the food products acceptability. Insoluble fibre tends to make foods chewy whereas soluble adds viscosity. By degrading them chemically or using enzymes these properties could be adjusted to the product requirements.

Some fibres are even sweet-tasting e.g. fructooligo-saccharide (FOS) and isomalto-oligosaccharides that could be used advantageously in sweets, so it not only provides sweetness to replace sugar but provides healthy fibre. Thus, not only sugar content of the sweets could be reduced but also make it gut-friendly. Such products would be acceptable to diabetics as well as weight-watchers.

Conclusion

Dietary fibre needs to be focused by everyone as it has many health benefits, and there are now many ways to make the fibre-rich products more appealing. With some innovative formulation and processing, some of the negative aspects of the fibre could be overcome and when consumers accept the high-fibre food products, it would be easier to make healthier processed foods.

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ENZYMES AT WORK: ENHANCING FRUIT PROCESSING

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Humans have been consuming fruits since the very early stages of their evolution. Fruits are a rich source of fibre and vitamins. However, fruits are seasonal produce and perishable. Fruit processing allows us to indulge in these fruits throughout the year. It involves transforming fresh fruits into preserved products and extending their shelf life; through methods like canning, freezing, drying, and juicing, with the primary goal of maintaining quality and nutritional value while preventing spoilage.

India produces 256 million MT of fruits and vegetables annually, making it the world's second-largest producer. However, the processing levels in fruits & vegetables currently stand at close to 2%. Fruit processing products include canned fruit, fruit juices, jams and jellies, dried fruit, frozen fruits, pickles, candied fruits, and fruit fillings for pastries, etc.

Changes in fruit during processing

Many changes take place in fruit from the time of harvest till it is processed into the final product. Fruit ripening involves many changes including colour change, flesh softening, sugar accumulation and degradation of nutrients. Ethylene biosynthesis is the key event of ripening. It is a hormone that regulates the changes mentioned above. Colour change occurs due to the degradation of the chlorophyll pigment and the unveiling of the already present pigments like carotenoid and anthocyanin. Flesh softening is caused due to alterations to the cell wall components pectin & hemicellulose by various enzymes. Slicing or peeling the fruit can lead to enzymic browning and loss of fibre. However, processes like freezing and canning can prevent spoilage and lower the amount of nutrient loss by stopping these processes. Canning adds heat to foods, inactivating enzymes and destroying microorganisms, preventing spoilage and ensuring important nutrients aren't lost.

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Freezing slows down chemical reactions and prevents nutrient loss. The extent of nutrient loss depends on the food and its nutrients. For instance, carrots lose little vitamin C during freezing, but a significant proportion of it is lost during canning due to their water-soluble nature. Vitamin A loss is lower during canning due to its heat stability. Depending on the commodity, different processes may preserve nutrient value (1,2).

Enzymes and their applications

Enzymes are proteins and biological catalysts. They cause rapid browning of cut fruits, altering the appearance, nutritive value, colour, texture, and flavour of the products. However, the same enzymes are used as processing aids and can be benefitted from. They play a crucial role in the processing of fruits. The use of enzymes in the food industry has increased significantly, generating more added value to the final product and an increase in production while reducing costs.

Studies on different fruits have shown that enzyme treatments significantly improve juice yield and quality. In apple juice, enzyme application enhances phenolic content. Studies on banana juice showed that pectinase treatments increased clarity and reduced viscosity, while enzyme-based treatments in papaya enhanced free juice flow. Understanding the functions of these enzymes is essential for their application in the right products (4).

Pectinases

Pectinases are enzymes that break down pectin, a polysaccharide found in plant cell walls. Pectinases are one the first enzymes to be used commercially in the juice industry and are used for clarification, maceration, extraction, and colour stabilization. It currently accounts for 20% of the global enzyme market. Pectinases are produced during the natural ripening process of some fruits, where they help soften their cell walls.

They are found in plants and fungi, with Aspergillus being the major commercial source. Pectin-rich fruits produce highly viscous purees, making direct juice extraction difficult, so pectic enzymes like polygalacturonases, pectin lyases, and pectin esterases are used to degrade pectin, improving extraction, reducing turbidity, and increasing filterability. The addition of pectinase facilitates hydrolysis of carbohydrates, allowing better fruit squeezing, and providing increased extraction yield.

Enzymatic depectinization is essential for juices with high pectin content, as dissolved pectin cause cloudiness and hinders filtration and concentration. In citrus juice extraction,since pressing alone leaves much of the liquid bound to pectin, these enzymes improve extraction and reduce viscosity while maintaining the characteristic cloudiness of juices like orange juice. Cloud stability is a challenge during production. Interestingly, pectinases themselves can help prevent cloud loss by breaking down pectin in a controlled manner, ensuring the juice remains stable without unwanted precipitation (3,5,6).

Cellulases

Cellulases are enzymes that promote the hydrolysis of cellulose. They are widely used in the beverage industry for producing fruit juices and during the wine-making process. Cellulases facilitate the extraction of juices and help macerate fruits to create fruit nectars. These enzymes can break down unpleasant-tasting compounds, releasing flavouring substances and enhancing the aroma and flavour of the beverages.

Cellulases are often used in combination with other enzymes, such as pectinases, to achieve optimal results in fruit processing. They also improve the release of pigments from the skins of fruits, which is especially beneficial for blackcurrants and red grapes.

Using cellulases simultaneously with pectinases allows for juice to be filtered directly from the pulp without the need for pressing. Enzymatic treatments can also soften fruit peels, enabling nearly 100% peel removal in citrus fruits and significantly reducing energy costs. Both pectinases and cellulases are essential for this enzymatic peeling process. Before enzyme treatment, fruits should be washed with chlorinated or hot water. Then, they should be infused with the enzyme solution and incubated in water heated to 40°C for 30 minutes. During this time, the enzymes penetrate the peel, digesting it to the point where it can be easily removed (7).

Xylanases (Hemicellulases)

Hemicellulase enzymes break down hemicellulose, aiding in cell wall degradation and improving cellulose hydrolysis by cellulase. A mix of pectinases, hemicellulases, and cellulases is used for enzymatic fruit peeling, particularly for apricots, nectarines, and peaches, while pectinases and certain hemicellulases work well for orange skin removal.

In juice production, cellulases, hemicellulases, and pectinases accelerate extraction, improve pressing efficiency, aid solid removal, and enhance clarity for a visually appealing final product (8).

Amylases

Amylases account for about 30% of the enzymes in the world market and are applied in many industrial processes, such as starch saccharification, fruit juices, and starch syrups. It converts starch to maltose during fruit ripening, giving ripe fruit its sweet flavour. One of the contributors to the haziness of juice is starch.

For instance, unripe apples contain up to 15% of starch. Most of the starch is removed from the juice during the initial processing however 5% usually remains. This residual starch can cause a haze in the juice as opposed to the clear juice desired by the consumers. Hence amylases play an important role in the clarification process.

Some of the other enzymes like glucose oxidase are primarily used as a natural preservative to extend shelf life by removing dissolved oxygen from fruit juices and purees, preventing browning reactions, while also contributing to maintaining colour and flavour stability by reducing enzymatic and non-enzymatic browning. For citrus juices, bitterness from limonin and naringin is a key concern, enzymes like limonoate dehydrogenase and naringinase, break down these bitter compounds.

Advantages and Challenges of Using Enzymes

Enzymes play a crucial role in food processing due to their natural, non-toxic nature and ability to catalyze specific reactions. Their activity can be precisely controlled by adjusting factors like temperature, pH, and enzyme concentration, and they can be easily inactivated once the desired reaction is complete. Compared to mechanical extraction, enzymatic processes enhance juice quality and increase the availability of bioactive compounds.

However, it also presents some challenges like sensitivity to pH and temperature and the risk of over-processing, which can affect texture, flavour, and clarity. Residual enzyme activity may also impact product stability during storage.

To address these issues, optimizing pH, temperature, and enzyme dosage is important. Strategies like enzyme immobilization for stability and blending complementary enzymes can help enhance their efficiency.

Enzymes play a crucial role in the food processing industry, influencing the texture, colour, flavour, and overall taste of processed products. Controlling enzyme stability is vital for preserving the nutritional content and sensory qualities of fruits and vegetables.

Advanced techniques such as high hydrostatic pressure, high-pressure homogenization, pulsed electric fields, and ultrasound processing have been introduced to maintain these attributes. These non-thermal methods are effective and minimize the negative thermal effects on the product's quality and texture.

Conclusion

The post-harvest shelf life of fruits and vegetables is very limited due to their perishable nature. In India, more than 20–25% of fruits and vegetables are spoiled before utilisation.

The Indian government has recognized this sector's potential for economic growth and employment and has introduced policy measures, such as financial incentives from the Ministry of Food Processing Industries (MoFPI), mega food parks, and integrated cold chain projects to support the industry's development.

These measures aim to enhance supply chain efficiencies and reduce wastage. To make it more sustainable the waste from the fruit processing industry can further be utilized for animal feed, and non-food applications like packaging materials, biofuels etc. By leveraging these initiatives and innovative solutions, India can significantly reduce post-harvest losses, promote sustainability, and create new economic opportunities across various sectors.

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THE POTENTIAL OF POTATOES

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Introduction- Beyond misconceptions

Potatoes often become a central point in nutritional discussions. The real issue with potatoes isn't the vegetable itself; it's how we prepare and consume them. Associated with fried and calorie-laden chips, it's easy to overlook this versatile vegetable.

However, when prepared thoughtfully, potatoes can be a nutritional powerhouse.

As a staple food in many cultures, potatoes provide a valuable energy source and numerous health benefits, making them an essential part of global diets.

Various varieties of potatoes in India:

India has a wide variety of potatoes suited for different climates and culinary uses:

1. Kufri Varieties: Popular high-yield types like Kufri Jyoti, Pukhraj, and Sindhuri, developed by CPRI (Central Potato Research Institute).

2. Local Varieties: Traditional types like Pahadi Aloo (hilly regions) and Bhura Aloo (Uttar Pradesh).

3. Processing Varieties: Kufri Chipsona and Lady Rosetta, ideal for chips and fries.

4. Exotic Varieties: Red and Purple potatoes, grown in small quantities, are known for their taste and nutrition.

5. Regional Varieties: Kannur potatoes (Kerala) and Bengal potatoes (West Bengal).

6. Hybrids: Modern types bred for disease resistance and better yield.

Each variety suits specific cooking methods like frying, boiling, or baking (1).

Nutritional information:

Many people believe that potatoes are just empty calories, but in reality, they are rich in nutrients. Potatoes provide a good source of potassium, fibre, and essential vitamins. For example, a 100-gram raw serving of a brown-skinned potato contains the following nutritional values: 70 calories, 15 grams of carbohydrates, 2 grams of fibre, 2 grams of protein, 24 milligrams of vitamin C, and 545 milligrams of potassium. Potatoes have a lot to offer.

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Key health benefits:

Studies highlight the essential role of nutrition in combating global metabolic disorders, such as diabetes, cancer, and cardiovascular diseases. A higher intake of fruits and vegetables, including potatoes, is linked to protective health benefits. Often misunderstood as contributors to obesity, potatoes contain valuable phytonutrients that may help reduce chronic disease risk.

• Weight control:

Potato chips and French fries are associated with obesity risk due to their high fat and caloric content. In contrast, whole potatoes are low in energy density and unlikely to promote obesity, as they are low in fat and high in water (2). The real concern lies with potato-based foods that have added sugars and fats.

Interestingly, potatoes may help control appetite and reduce weight gain by providing satiation. Raw potatoes contain resistant starch, which is digested slowly and can aid in weight loss. However, cooking transforms most of this resistant starch into a quickly digestible form. Cooling cooked potatoes allows some of the starch to reform back into resistant starch, but reheating may reduce these benefits. Studies show that children consume about 40% fewer calories when eating boiled mashed potatoes with meat compared to when meat is paired with pasta or rice (3). Potato protein hydrolysates contain peptides that promote feelings of fullness by stimulating the release of hormones such as cholecystokinin (CCK) and glucagon-like peptide-1 (GLP-1), both of which help reduce hunger and enhance satiety.

Additionally, to support muscle maintenance which is an important factor during weight loss, potato protein concentrate can increase the rates of muscle protein synthesis. Animal studies have demonstrated that a dipeptide derived from potato protein hydrolysate, when combined with exercise, effectively suppresses weight gain induced by a high-fat diet and reduces liver fat accumulation (10). This indicates that potato protein hydrolysates may offer potential benefits in reducing body fat and improving overall body composition.

• Anti-hyperlipidaemic, Anti-hypertensive and Anti-inflammatory Effects:

Numerous animal feeding studies have demonstrated that consuming potatoes may help lower cholesterol levels. This effect is attributed to the presence of various components in potatoes, including protein, resistant and phosphorylated starch, fibre, glycoalkaloids, and phenolic compounds. Retrograded starch, in particular, promotes the excretion of bile acids, which leads to a reduction in serum cholesterol levels. Additionally, it also inhibits the synthesis of fatty acids.

Potassium is crucial for managing hypertension. While bananas are commonly recognized as a good source of potassium, a medium baked potato with skin contains more than twice as much. This is particularly important for older adults who often face blood pressure issues, as removing potatoes from their diet can lead to potassium deficiencies.

The DASH diet, which aims to lower blood pressure, includes potatoes due to their high potassium content but one should not load it with butter, sour cream, and salt.

Instead, use herbs, garlic, olive oil, and lemon for seasoning. A study showed that consuming six to eight small purple potatoes twice daily significantly reduced systolic blood pressure in hypertensive subjects, due to the polyphenols in these potatoes (4). Increasing potassium-rich foods like potatoes, which are low in sodium, can help combat hypertension and hence various cardiovascular diseases.

Coloured potatoes, like purple and red varieties, contain bioactive compounds such as polyphenols and anthocyanins with anti-inflammatory properties. These compounds help reduce oxidative stress and inflammation by neutralizing free radicals. Additionally, potato phenolics, glycoalkaloids, resistant starch, and fibre can also modulate inflammatory markers.

• Anticancer Effect:
Numerous studies have shown the anticancer effects of potato extracts, emphasizing the significant role of antioxidants found in potatoes, such as phenolic acids, anthocyanins, glycoalkaloids, fibre, and proteinase inhibitors. These compounds have been shown to suppress cancer cell proliferation both in vitro and in vivo (4).

Phenolic acids and anthocyanins from potatoes are shown to have anti-carcinogenic activity. α-Solanine and α-chaconine, the primary steroidal glycoalkaloids found in potatoes, have been extensively studied for their antitumor properties. Commercially available potato fibre extract (Potex) has been recognised to exhibit anti-proliferative effects on various tumour cell cultures by reducing cancer cell motility, inducing apoptosis, and causing morphological changes in the tumour cells.

Impact of cooking on the nutritional content of potatoes:

The nutritional composition of potatoes is influenced by various pre-harvest and post-harvest factors. Potatoes can be cooked through various methods like boiling, roasting, baking, microwaving, and frying, each affecting nutrient levels differently. Raw potatoes contain 79% water, which drops to 77% when boiled, 75% when baked, and 72% when microwaved. Frying results in the highest water loss, with French fries losing approximately 39%. The moisture content of finished products like potato chips is between 1.3% and 1.5% to maintain crispness and stability.

Boiling reduces potassium by 22% and vitamin C by 62% due to leaching and thermal degradation. Baking has minimal impact on potassium but reduces vitamin C by approximately 35%. Microwaving preserves vitamin C best due to shorter cooking times (5).

While frying can degrade sensitive nutrients, it also significantly decreases water content, concentrating nutrients in the final product, such as in potato chips.

The bioavailability of nutrients in potatoes is affected by food matrix complexity, digestion, and absorption processes. Potatoes can contribute significantly to energy needs and high intake can meet a substantial portion of daily energy requirements.

In summary, cooking breaks down the starches in potatoes, making them easier to digest and more energy-accessible. When cooked potatoes cool, they form resistant starch, which may enhance gut health by acting as a prebiotic.

To retain fibre and nutrients, cook potatoes with their skins on. Use cooking methods such as steaming or microwaving to minimize nutrient loss, and avoid overcooking to preserve both texture and nutritional quality.

Role in the food industry-

Potatoes are incredibly versatile in the food industry, as they can be prepared in various forms, including fresh, mashed, roasted, boiled, and fried. They are essential ingredients in snacks such as chips and fries, as well as in frozen foods, soups, and ready-to-eat meals. Additionally, potatoes help provide structure and moisture retention in baked goods and doughs. Their cost-effectiveness stems from their widespread cultivation and efficient processing, making them an affordable option for both producers and consumers.

Almost every part of the potato can be utilized starting from extracting functional ingredients like starch and protein isolates to peel repurposing. For instance, starch can be extracted to serve as a thickening agent for soups, sauces, and gravies, or as a binding agent for meat and plant-based products. Potato proteins are also extracted and added to enhance the nutrition of beverages, protein bars, and supplements. Potato protein has 18 amino acids, offering high nutritional value, comparable to egg protein (6). It is also rich in lysine, making it a suitable alternative to wheat products for those with wheat allergies. Furthermore, these proteins are used for their emulsification properties in various dressings.

Challenges and considerations-

• Influence of fat on the nutritional profile of processed potatoes:

Potatoes are often paired with ingredients like oil, butter, or dairy to enhance their flavour. Fat is important as it carries flavours, improves texture, and provides lubrication when eaten but the caloric content of the dish increases substantially.

During cooking, starch granules in potatoes undergo thermal gelatinization, changing from small, compact structures to larger, softer ones. Since cooked potatoes retain water within the starch granules, they can have a dry mouthfeel, which is why sauces and other ingredients are typically served alongside to add moisture.

Fat enhances the texture of cooked potatoes, as seen in dishes like fried chips, creamy mashed potatoes with milk and butter, and baked potatoes topped with various high-fat dairy products. While plain potatoes have an excellent nutritional profile, adding fat-rich condiments especially those high in saturated fatty acids (SFAs) can negatively affect their overall health benefits.

Some food ingredients, like micro-particulated proteins and gums, can mimic the sensory qualities of fat while reducing calories. However, processed potato products rarely use these fat mimetics, likely due to limited consumer demand and regulatory issues. Using these ingredients could lead to potato products that are both appealing and lower in calories. These fat mimetics could represent an opportunity to produce potato products with high sensory appeal yet reduced calories.

• Strategies to control fat absorption and content in fried potato products:

Controlling fat absorption in fried potatoes can be achieved through processing methods like blanching, pre-drying, coating, and soaking in brine. The absorption of fat in fried potatoes happens as water is expelled from the product. This means that as the potato cooks longer, more water is removed, increasing fat content. For instance, par-fried potatoes typically contain fat concentrations of 3–5%, while completely fried potatoes have fat concentrations ranging from 16–18%.

Removing water from potatoes before cooking can lower fat absorption since less oil replaces the water during frying. It's important to maintain the right frying temperature; lower temperatures lead to longer frying times and increased oil absorption, while higher temperatures can cause poor texture and burning. Vacuum frying can reduce fat content due to lower temperatures that preserve water.

After frying, let the potatoes drain on a wire rack or absorbent paper immediately. Hot air blasting can help remove excess surface oil. Most fat absorption happens after frying, so draining right away reduces fat content. Centrifugation after frying is also effective in lowering fat levels. Combining vacuum frying with centrifugal oil draining can reduce the fat content further.An experiment was done to find out the oil content of potato chips after frying, samples fried at 120 C for 360 s (non-centrifuged) had a final oil content of 0.43 g/g product compared to 0.097 g/g product for the centrifuged ones (7).

Using food biopolymers, such as gellan gum, modified cellulose, and proteins, can reduce the fat content of fried potatoes and are approved in India for use. These biopolymers minimize water evaporation from the potato's crust, leading to less fat absorption. For example, hydrocolloid coatings not only curb oil uptake due to their thermos-gelling properties but are also invisible and do not alter the sensory qualities of the food (8). The effect of adding gellan gum was studied on the sev prepared. Adding gellan gum at 0.25% (w/w) (based on chickpea flour) significantly reduced the oil content in the sev from 37.02% in the control to 27.91% (9). Hence adding these results in lower fat content, improved nutritional values, greater crispiness, and enhanced palatability in fried products.

Emerging technologies like Dynamic Action Fryers and Controlled Dynamic Radiant Frying (CDRF) are being developed for reducing the fat content of fried potatoes, cutting oil usage by 30 to 50% compared to traditional immersion frying.

It uses high-temperature radiant emitters to generate infrared radiation, effectively mimicking immersion frying to achieve water evaporation, crust formation, and browning. Both have successfully produced fried potato products such as potato crisps, wedges, and French fries.

Conclusion:

Potatoes are driving innovation in food product development by leveraging their functional properties, cost-effectiveness, and sustainability to meet evolving consumer demands. Potato products offer essential macronutrients and micronutrients, such as dietary fibre and potassium, which are often under-consumed. Despite these nutritional benefits, potatoes often face a negative perception. However, techniques like oven-baked and par-frying can help lower fat content while preserving sensitive nutrients. Additionally, new technologies such as biopolymer coatings, vacuum frying, and cooling processes are being developed to enhance the nutritional profile of fried potato products by reducing fat and increasing resistant starch and fibre content. These advancements aim to create healthier potato options.

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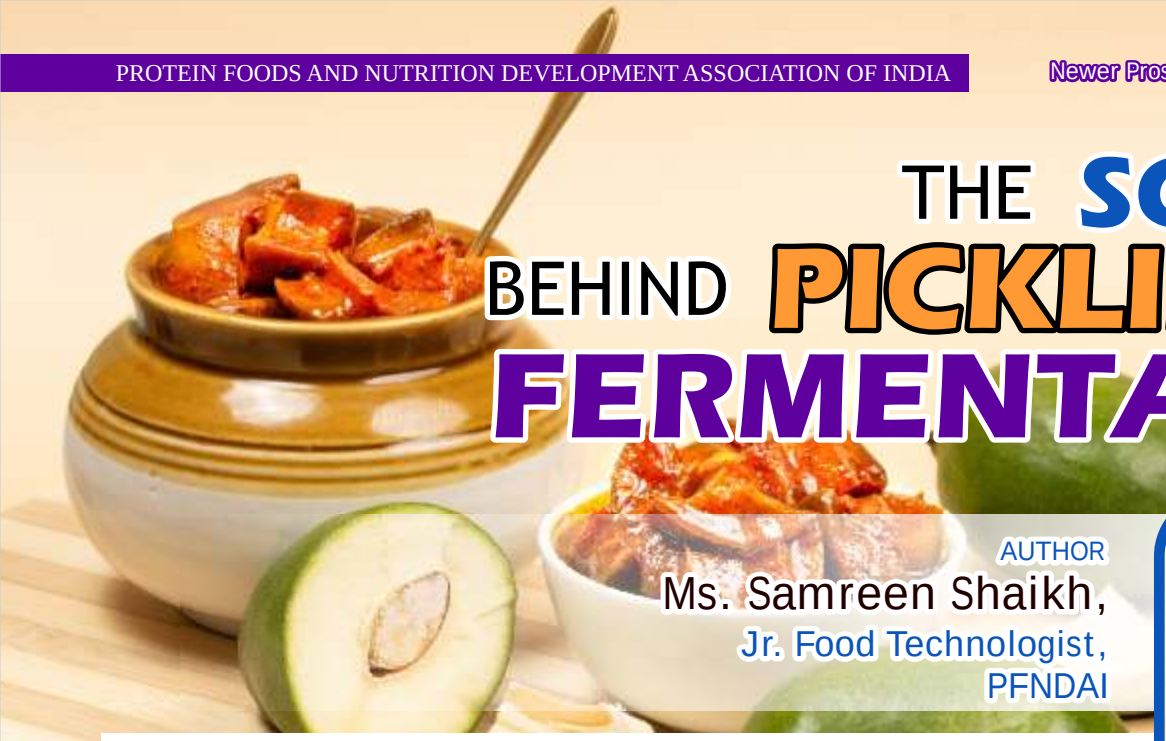

THE SCIENCE BEHIND PICKLING AND FERMENTATION

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Do you like pickles? Your mouth must have started watering after hearing the word pickle. Pickles also known as achaar in India is a condiment that is available in every kitchen and consumed in almost every house.

Traditional Indian Achaar is made from various fruits and vegetables like mango, lemon, carrot, chillies, garlic, etc. along with spices (red chilli powder, mustard seeds, turmeric, fenugreek), salt, oil, etc. which they store for the entire year. In India, pickles are mostly made in brine, vinegar or oil and eaten along with Dal rice, parathas, khichdi, pulao, etc. Other than fruits and vegetables, meat, fish and eggs are also pickled. Pickles are made at home and are also available at the market.

Pickling is a preservation technique which has been practised for a long time. It increases the shelf life of the product and also inhibits the growth of undesirable microorganisms. During the pickling process, the product is typically submerged in brine, vinegar or oil. Cucumbers are the most commonly used vegetable for making pickles worldwide. Other than cucumbers, cabbage is used to make fermented products such as sauerkraut and kimchi and is widely consumed.

Types of Pickling

Fermented pickles undergo a curing process where fermentative bacteria produce the acid necessary for preservation. In this method, food is immersed in a brine solution made of water and salt. Naturally occurring bacteria, primarily lactic acid bacteria (LAB), grow in this environment. The salt concentration is high enough to inhibit the growth of spoilage bacteria. LAB's are gram positive, acid tolerant, bacteria. They are strictly fermentative organisms, with lactic acid being the primary end product of their metabolism. Various genera of LAB include Lactobacillus, Pediococcus, Enterococcus, Lactococcus, Leuconostoc, and Streptococcus.

During the traditional pickling process, genera such as Lactobacillus, leuconostoc, pediococcus, and some other sare dominant due to their ability to tolerate high concentrations of salt (1).

LAB ferment the sugars naturally present in the food, producing lactic acid, which lowers the pH, preserves the food, and imparts a distinct sour and tangy flavour (1). In traditional fermentation of pickles, usually mixed culture is used for the fermentation process which may include bacteria as well as yeasts. Consuming these traditional pickles as part of one's diet offers health benefits.

Lactic acid bacteria (LAB), particularly Lactobacillus, play a crucial role in the fermentation process of many traditional pickles.Other than LAB, there are several acetic acid bacteria (AAB) which also carry out the fermentation process, the by-product of which is acetic acid. The most common AAB is the Acetobacter. Creating an anaerobic environment is essential for successful fermentation in pickling. Oxygen can inhibit the growth of undesirable microorganisms and promote the growth of beneficial bacteria. To get anaerobic conditions, the product must be completely submerged in a brine solution and sealed in an airtight container.

Non-fermented pickling is a method of preserving food, particularly vegetables, in a vinegar without involving the natural bacterial fermentation process that typically occurs in traditional pickling. Instead, the preservation relies primarily on vinegar, salt, and sometimes sugar, along with spices, to create a flavourful, tangy result. This process is often quicker than fermentation, making it a more straightforward and accessible way to make pickles.Non-fermented pickling involves preparing vegetables like cucumbers, carrots, onions, cauliflower, or green beans, washing them thoroughly and cutting them into desired shapes. Sterilizing jars is crucial to prevent bacterial growth and ensure the pickles last longer. The vinegar solution should be hot when poured over the vegetables to help them absorb the flavours.Seal the jars with lids and keep it in a water bath or place the jars in boiling water. Non-fermented pickling offers several advantages over traditional pickling, including a faster process.

Varieties of Pickles

Pickled eggs are produced mostly as a snack and it is enjoyed by people worldwide. It is necessary to use a good quality sound eggs to obtain a good quality product. Mostly the eggs of hens or quail are used for pickles. The eggs are cleaned, boiled until the contents are solid, peeled, after that the eggs are placed in glass jars and the brine is poured to cover the eggs. Pickled eggs are often served as a snack, appetizer, or as part of a pub platter. There are many variations of pickling recipes that may include ingredients such as onions, garlic, mustard seeds, dill, beet juice (which gives the eggs a vibrant pink colour), and a variety of herbs and spices (2). The shelf life of pickled eggs is influenced by various factors such as formulation, processing, packaging, and storage conditions.

Fish and shellfish pickles, when prepared carefully under hygienic conditions and with the appropriate amounts of salt, preservatives, and spices, typically have an average shelf life of one year. Most sea fish, such as prawn, squid, tuna, pomfret, and mackerel, are ideal for making fish pickles. For making prawns pickle, it is first cleaned, and deveined, they are then fried till golden brown colour. The spices used to make prawns pickle include salt, chilli, oil, turmeric, garlic, ginger, lemon, etc (3). All the spices along with the fried prawns are filled in a jar and oil is poured over it. The bottles are then sealed air tight.

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As meat and meat products are highly perishable, it is very essential to preserve them. The high perishability is caused by the ideal environment for the growth of spoilage microorganisms and common food-borne pathogens. Meat pickles are convenient, ready-to-eat products with good shelf stability. Pickling meat results in a delicious and nutritious shelf-stable product with a relatively better shelf life. The process is similar to that of fish pickles. The acid produced after the fermentation affects the meat texture making it more tender and easily digestible (4).

Processing of Pickles

In Indian culture, pickles are mostly made from mango, lemon, chillies, garlic, carrot, amla, etc. The fruits or vegetables are first washed, cleaned and cut into small pieces. Salt and turmeric are applied and mixed to it and they are kept under the sun for at least 2-3 days, after which the mixture is again mixed with various spices, oil or brine and stored in a glass jar or bharni. This is again kept under sunlight for 4-5 days. Sunlight not only helps in the flavour development but also encourages fermentation due to the warm environment. These pickles stay fresh and can be stored for up to a year if properly handled. Other than this, there are instant pickles which are prepared in small amounts and consumed quickly for e.g. instant aam ka achar or pyaaz ka achar. It is an Indian bachelor's everyday flavour to go with dal rice and curd. And it is the best companion of khichdi and paratha.

Pickling is a process that increases the acidity of a product to prevent food spoilage organisms from growing and producing toxin. This can be done through fermentation or adding an acid ingredient like vinegar or lemon juice. Once the produce has been effectively fermented, it is essential to implement strategies to prevent spoilage caused by microorganisms that thrive in acidic environments by various methods such as pasteurization or storing in good condition. Additionally, measures should be taken to inactivate enzymes that could adversely impact the flavour, colour, and texture of the produce.

There are many problems that can arise during pickling which need to be identified and solved to prevent spoilage. Spoilage can be due to various reasons, which include insufficient heat treatment, not cleaning or washing the fruits/vegetables thoroughly that can carry microbes, pesticide residues, dirt, dust, to the final product, using a weak or a low concentration brine/vinegar, not keeping the pickles completely submerged in brine during the curing process, and storing the pickles at temperatures that are too warm.

Choose fresh, tender vegetables and firm fruits that are free from blemishes. Use them as soon as possible after harvesting. If you cannot use the fruits or vegetables within one or two hours, refrigerate them without washing or place them in a cool, well-ventilated area. Be sure to wash all fruits and vegetables thoroughly before processing. Ensure that the pickling product is completely submerged or covered with oil/acid/brine, etc. Store pickled products in a cool, dry and dark place away from direct sunlight (5).

Changes in the Texture and Nutritional Value

As we all know, the texture of the pickle is changed over time while they're stored. Pickle texture changes during storage due to several factors like fermentation, bacterial activity, pectin breakdown, moisture loss, and storage conditions. Fermentation in brine causes bacteria to break down sugars and other compounds in cucumbers, softening the texture over time.

Pectin, a natural substance in cucumber cell walls, breaks down during pickling, causing the cucumbers to lose their crispness and become softer. Moisture loss occurs due to the high salt content in brine, drawing out water, and thereby changing the texture of the cucumber. Storage conditions also affect texture, pickles stored at warmer temperatures are more likely to soften more quickly, while those stored in a cool place will retain their texture for a longer period. Enzymatic activity, which continues even after pickling, can also cause change in the texture. Proper storage can help slow down these processes and maintain a firmer texture (6).

The nutritional content of pickles can change during storage. During the fermentation process, initially, there's a loss of water, the loss of water is due to the salt content as it absorbs the moisture from the product due to osmosis. Salt penetrates the raw material through pores, leading to changes in water activity within the vegetables. There can also be a loss of Vitamin C content. As vitamin C is sensitive to light, heat and oxygen, processing such as blanching of vegetables or fruits before pickling, and exposure to light, or oxygen can cause its loss (7).

Apart from loss of nutrients, pickles can provide health benefits as it is a good source of probiotics, and antioxidants. Some great benefits include boosting your body's natural defences against infections in the gastrointestinal tract, helping to prevent urogenital infections, fighting cancer, improving digestion, and lowering cholesterol levels in your blood (1). Fermented pickles, which are mostly made from tropical roots and tubers, are high in fibre and have been shown to enhance customers' palatability and digestive health. However, moderation is the key since pickles contain a high amount of oil and salt, it is important to consume pickles just as a condiment and not as a main dish.

Preservatives used and the Shelf life of Pickles

The salt, vinegar, spices and oil used in pickles itself acts as preservative inhibiting the growth of undesirable bacteria and thereby increasing the shelf life. In earlier days, pickles were made at home and kept in sunlight for few days which helps in increasing the shelf life. But now due to busy life schedules and women's stepping out for work, it becomes difficult and time consuming to prepare pickles at home. Due to which market/ready made pickles have become very popular. Pickles prepared in the industries contain preservatives to increase its shelf life. The common preservative used in most of the market pickles is sodium benzoate.

The shelf life of most of the pickles is 12-24 months as given on the pack. But, there are many factors which can affect its shelf life. It even depends on us how we handle it, for example if we keep it in a warm place mold growth will take place spoiling the pickle. Make sure to tightly close the lid of the jar to avoid moisture and air entering inside.

Future Trends

Pickles are a popular accompaniment in many countries, often served alongside meals or used as toppings for sandwiches, hot dogs, and a variety of other dishes. In recent years, there has been a significant shift in consumer awareness regarding health and wellness.

As a result, many people are increasingly opting for non-GMO, organic, and natural products that align with their dietary values and lifestyle choices. The pickle market is experiencing notable growth, driven not only by the desire for flavourful snacks but also by the numerous health benefits associated with pickles. These benefits include gut health support due to their probiotic content, as well as their ability to enhance the flavour of meals.

Furthermore, the rise of the vegan population has sparked a greater demand for both vegan-friendly pickles and gourmet options. This trend has encouraged producers to innovate and create unique flavours and styles of pickles that cater to diverse dietary preferences. As a result, consumers are now enjoying an expanded range of pickle varieties, from traditional dill to more exotic flavours that incorporate various spices and ingredients (9).

As we approach 2025, the world of pickles is set to evolve in ways that will surprise consumers. Health and wellness are driving product innovation, with consumers seeking products that offer taste with health benefits.

This trend is driving the introduction of products that are lower in sodium, sugar, and preservatives. Organic and natural ingredients are being emphasized, with manufacturers developing low-sodium options to cater to health-conscious consumers.

Diverse and exotic flavours are also emerging, with consumers becoming more exploratory with their food choices. By 2025, there will be an even wider array of flavours catering to a global palate. Fusion flavours, such as Indian pickles infused with Korean kimchi spices, will dominate the market. Regional specialties will continue to gain popularity, with brands highlighting the unique flavours of specific regions (10).

Conclusion

Pickling is an effective and versatile method for preserving food by storing them in a mixture of salt, oil, and spices. Vinegar or brine, can also be used. This technique was originally created to extend the shelf life of perishable foods, which is why pickles can be made from a variety of fruits and vegetables.

During the pickling process, the ingredients undergo fermentation and transformation, resulting in enhanced flavour and improved nutritional value, showcasing the powerful benefits of this preservation method.

Pickles are not just about preserving foods. They connect us to traditions, memories, and fresh flavours that enhance our meals. They are more than simple toppings; they bring joy to our taste buds. Each bite can remind us of special moments and invite us to enjoy our food even more (8).

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NOURISHING A HEALTHIER TOMORROW: THE ROLE OF NUTRITION IN MODERN LIFESTYLES

NAA REPORT by
Ms Simran Vichare,
Nutritionist, PFNDAI

Protein Foods & Nutrition Development Association of India (PFNDAI) organized a webinar on 'Nourishing a Healthier Tomorrow: The Role of Nutrition in Modern Lifestyles' on the 31stof January 2025.This webinar was a part of the Nutrition Awareness Activity in collaboration with SNDT College of Home Science, Pune. The sponsors were Mondelez India Foods Pvt. Ltd., ITC Ltd., & Kellanova India.

The welcome address of the webinar was given by Dr Shashank Bhalkar, Executive Director of PFNDAI, who welcomed all the speakers and attendees. He started by discussing the critical role of nutrition in modern lifestyles and highlighted India's challenges of undernutrition and overnutrition, noting the impact on health and immunity. With urbanization leading to unhealthy eating habits, the importance of mindful eating and portion control was emphasized by Dr Bhalkar. Concerns about future food availability were raised, advocating for sustainable, plant-based diets as a solution. He welcomed the industry experts to provide further insights and expressed his gratitude to the sponsoring companies and SNDT Women's University for their support.

Ms Sanyukta Telange, Food Technologist and regulatory Support at PFNDAI introduced Ms Shraddha Patankar, Assistant professor in the Department of Food Science and Nutrition at SNDT College of Home Science and later other speakers.

Ms Shraddha Patankar started with how in today's fast-paced world, nutrition plays a critical role in overall health and well-being.

Food choices impact physical, mental, and emotional health, particularly with the rising prevalence of various diseases following the pandemic. However, many are now opting for healthier options. She stated how balanced nutrition is essential; simple practices such as choosing whole grains, staying hydrated, and practising portion control can help, especially for those struggling with obesity. As individuals seek a healthier future, mindful eating and informed dietary choices must be a priority.

Role of Mindful Snacking in Modern Lifestyle and Nutrition was delivered by Ms. Nitika Vig, Nutrition Strategy and Comm Sr. Specialist Mondelez International. She started by discussing the importance of mindful eating, particularly in the context of snacking. She said while guidelines exist for food consumption, many struggle with implementing healthy eating behaviours, highlighting a gap in eating experiences. She explained mindfulness as a behavioural approach that focuses on being present and attentive in the moment. Snacking is a common practice worldwide, with varying frequencies across different cultures and age groups. In India, for instance, 97% of consumers snack daily, with a growing focus on well-being and mindfulness. She described the benefits of mindful eating including reduced overeating, improved digestion, and better nutrient absorption, it helps in managing emotional eating by increasing awareness of eating habits and triggers. She encourages consumers to reflect on their entire eating experience and to moderate portion sizes overallpromoting the idea that snacks can be enjoyed mindfully as part of a balanced lifestyle.

Ms. Nupur Agarrwal, Manager of Nutrition Science, ITC Foods Division talked on 'Plant-Based Protein'. She outlined the importance of plant-based proteins, particularly in India emphasising the need for a shift towards sustainable and healthier diets with the benefits of incorporating vegetables, fruits, pulses, and cereals into daily meals. She discussed the current protein scenario, noting that many Indians are unaware of vegetarian protein sources and often believe that staples like roti, dal, and rice are sufficient for their protein needs. Ms Agarrwal cited studies showing that many Indians face poor muscle health and low protein levels. She explained the importance of proteins. She compared plant and animal proteins, noting that while animal proteins are generally of higher quality, certain plant proteins, like soy, can provide a balanced amino acid profile when combined properly. She encouraged everyone to incorporate plant-based foods, such as whole grains, beans, lentils, nuts, and seeds, to effectively meet their daily protein needs.

Mr Swarn Singh, R&D Director - Kellanova South Asiaspoke on 'Balancing Nutrition in Modern Lifestyles: Trends, Challenges, and Everyday Solutions'. He discussed the various aspects of nutrition and consumer behaviour in India, highlighting challenges and trends. He gave an overview of Indian eating habits, noting that busy lifestyles and a lack of exercise contribute to poor dietary choices.

He pointed out key nutrition trends, such as the growing demand for locally sourced ingredients, fortified products, and low/no sugar alternatives as consumers are increasingly interested in healthy eating, with a focus on millet and oats, and are willing to pay more for sustainable food options. He highlighted the importance of meal planning and education in combating misinformation about nutrition, suggesting that individuals should stay informed about dietary choices.

The speakers answered all the queries with great enthusiasm. Overall, the discussion was very lively and interactive. Finally, Ms. Anuja Padte, Food Scientist at

PFNDAI offered a vote of thanks. She thanked webinar sponsors Mondelez India Foods Pvt. Ltd, ITC Ltd., & Kellanova India Pvt. Ltd. for supporting and sponsoring the webinar. She offered gratitude to Ms Vig, Ms Agarrwal & Mr Singh for spreading awareness on these important topics. She thanked Ms Patankar, Ms Kinikar and SNDT Pune University for being support. She thanked the attendees and PFNDAI's staff for making the event successful.

Following this, the prize distribution event was conducted on 7th February 2025. Dr Sanjog Surve, Independent Consultant and Ex-Chairman of PFNDAI interacted with the students present. He told everyone to thoroughly understand basic principles of nutrition and food technology while studying and later. He said curiosity and imagination should never leave a student. He then mentioned the work in the food industries and the numerous opportunities that follow. He answered the questions posted by students about the same.

Dr Alka Walavalkar, Director - Resonance Clinical Nutritionist who was one of the judges of the contest, then interacted with the students and commended the students' hard work and creativity. Ms Samreen Shaikh then announced the winners of the contest and thanked Ms Agarrwal and Dr Walavalkar for judging the contest.

The webinar recording is available on the following link: (https://fb.watch/xGBCwqKRHU/)

REGULATORY ROUND UP

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

Order regarding the timeline for the compliance of amendments in labelling provisions : A decision was taken regarding the compliance of implementation of amendments in labelling provisions in the 45th Food authority meeting. As per the note from the Food authorities, all amendments in the Labelling and Display Regulation will be made effective from 01 July with some conditions.

The condition is that the gap between the date of amendment and 01 July should be a minimum 180 days and if not, the effective date would be 01 July of the next year. For example - If final amendment notification in Labelling and Display is issued on 31.12.24, then the effective date would be 01 July 25. If the amendment is issued after 01.01.25, then 180 days condition would not be fulfilled and the actual implementation date would be 01.07.26.

This order has many positive repercussions. Many times, there are small and big changes in the labelling provisions. Food authorities do give some time for compliance of implementation.

However, it becomes a supply chain nightmare for the FBOs. New packing material must be procured with the amendments suggested. The existing printed packing materials are procured as per MOQs. In case of less moving products there is huge stock of materials is to be consumed which can not be used after date of implementation.

Otherwise, it has to be discarded. For small businesses, this is for almost all the packing materials procured. This new order will give sufficient breathing time to procure new and consume existing packing materials. This will help business of saving financial loss and material loss.

Therefore, this is welcome step by Food authorities for ease of doing business. It will help a larger goal of waste reduction and environment protection.

RESEARCH IN HEALTH & NUTRITION

Animal products improve child nutrition in Africa

The consumption of milk products, eggs, and fish positively impacts childhood development in Africa.A study by CABI's regional centre for Africa in Nairobi, Kenya and the University of Bonn used data from five African countries, including over 32,000 child observations.Children who consumed animal products suffered less from malnutrition and developmental deficiencies.

Around 150 million children globally suffer from growth and developmental disorders, often caused by insufficient nutrient intake, leading to "stunting."Previous studies have shown that meat, milk products, eggs, and fish reduce the risk of developmental deficits, but reliable evidence in Africa was lacking until this study.

The study showed that occasional consumption of animal products reduced the risk of stunting by almost seven percentage points. Eggs had the most significant positive effect, followed by milk products and fish. The effect of meat varied between countries.Fruits, vegetables, and pulses also supported growth and development but were less effective than animal products.

In rural areas, access to nutritious plant-based food is often limited, and improving access to animal-sourced foods is crucial to combat malnutrition. The results of the study are specific to Africa and cannot be applied to richer countries. Livestock farming contributes significantly to global warming, and reducing animal product consumption worldwide is necessary to achieve climate targets.

Different approaches are needed: reducing consumption in high-income countries while improving access to animal products in poorer populations in Africa.
https://www.sciencedaily.com/releases/2024/12/241202150124.htm

All people are unique -- also in the gut

Science Daily November 4, 2024

A recent study by the Department of Nutrition, Exercise and Sports at the University of Copenhagen has expanded our understanding of the gut and the life of gut bacteria.

The study emphasizes how changes in the gut environment affect the composition and activity of gut bacteria, which could help explain the diversity of gut bacteria among individuals and why people react differently to the same food.In 2021, researchers asked 50 subjects to swallow a capsule about the size of a thumb joint while eating breakfast.

This capsule travelled through the digestive system—from the stomach to the small intestine and finally to the large intestine— collecting data on pH, temperature, and pressure. The capsule, retrieved from feces 12 to 72 hours later, revealed significant individual differences in the gut environment and travel time through the gut.

The time taken for the capsule to pass through the small intestine varied greatly among individuals, from 2 hours in some to 10 hours in others. As nutrient absorption primarily occurs in the small intestine, this variation likely affects nutrient uptake and the amount of food that reaches the large intestine, where gut bacteria play a role.

Traditionally, gut activity has been assessed through stool samples compared to dietary intake. However, the capsule provided more accurate insights into environmental changes throughout the gut.

The study found that the environment within the gut—including pH changes—impacts bacterial composition and activity. This connection between gut conditions and bacterial diversity could explain why individuals have different gut bacteria and dietary responses.These findings suggest that individual differences in gut physiology and environment significantly influence digestion, nutrient absorption, and bowel movement patterns. This supports the development of personalized nutrition guidelines.The study highlighted the importance of pH in the gut. The capsule tracked pH changes, starting from the acidic stomach environment to the alkaline small intestine and then to the large intestine, where the activity of gut bacteria and fatty acid production caused pH fluctuations.

Associate Professor Henrik Roager, who led the study, emphasized that this new knowledge could be instrumental in understanding individual dietary responses and informing future nutritional guidelines.
https://www.sciencedaily.com/releases/2024/12/241202123644.htm

A low omega-6, omega-3 rich diet and fish oil may slow prostate cancer growth

Science Daily December 13, 2024

A recent study conducted by researchers at UCLA's Jonsson Comprehensive Cancer Center indicates that dietary changes may help slow cancer cell growth in men with early-stage prostate cancer under active surveillance.

Published in the Journal of Clinical Oncology, the study found that men who adopted a diet low in omega-6 fatty acids and high in omega-3s, supplemented with fish oil, experienced a significant reduction in cancer cell proliferation after one year.

In this clinical trial, known as CAPFISH-3, 100 men with low-risk or favorable intermediate-risk prostate cancer were randomly assigned to one of two groups. One group continued their regular diet, while the other followed the specialized diet and took fish oil supplements. Participants in the intervention group received personalized dietary counseling from registered dietitian nutritionists, focusing on reducing foods high in omega-6—such as chips, cookies, mayonnaise, and fried or processed items—and increasing intake of omega-3s through fish oil capsules and healthier fat alternatives like olive oil.

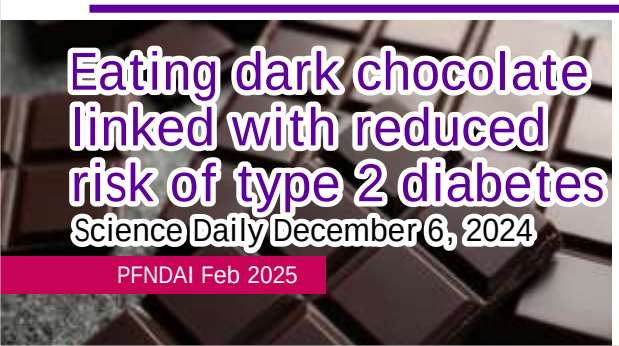
Researchers measured changes in the Ki-67 index, a biomarker that indicates the rate at which cancer cells are multiplying. The results showed a 15% decrease in the Ki-67 index for the diet and fish oil group, compared to a 24% increase in the control group. This suggests that the dietary intervention may slow down cancer growth, potentially delaying the need for more aggressive treatments like surgery or radiation.

However, no significant differences were observed in other cancer progression markers, such as Gleason grade.

While the findings are promising, the researchers emphasized the need for further studies to confirm the long-term benefits of adjusting omega-6 and omega-3 fatty acid intake in managing prostate cancer. Larger trials are necessary to explore the impact of these dietary changes on cancer progression, treatment outcomes, and survival rates.

This study sheds light on the potential role of diet in cancer management and offers hope for non-invasive strategies to influence disease progression. It also opens up conversations about how lifestyle choices, such as dietary habits, might affect overall health and chronic conditions related to inflammation.

https://www.sciencedaily.com/releases/2024/12/241213211326.htm



Eating dark chocolate linked with reduced risk of type 2 diabetes

Science Daily December 6, 2024

A new study from the Harvard T.H. Chan School of Public Health suggests that consuming dark chocolate—but not milk chocolate—may be associated with a lower risk of developing type 2 diabetes (T2D).

Lead author Binkai Liu, a doctoral student in the Department of Nutrition, emphasizes that

"not all chocolate is created equal," highlighting the potential health benefits of choosing dark chocolate over milk chocolate.

Published online on December 4 in The BMJ, the research analysed data from over 192,000 adults participating in the Nurses' Health Studies I and II and the Health Professionals Follow-up Study over more than 30 years. All participants were free of diabetes at the outset and provided detailed reports on their dietary habits, including chocolate consumption, as well as updates on their diabetes status and body weight.

Participants who consumed at least five servings of dark chocolate per week showed a 21% lower risk of developing T2D compared to those who never or rarely consumed chocolate. Those who ate at least five ounces of any type of chocolate per week had a 10% lower risk of T2D.There was a 3% reduction in diabetes risk for every additional serving of dark chocolate consumed per week.

Consumption of milk chocolate was not associated with a reduced risk of T2D. In fact, increased intake of milk chocolate was linked to long-term weight gain, a known risk factor for diabetes.

Corresponding author Qi Sun, an associate professor in the Departments of Nutrition and Epidemiology, noted the surprising distinction between dark and milk chocolate's impact on diabetes risk and weight management. Despite similar calorie and saturated fat content, dark chocolate's rich polyphenol content may offset the negative effects of saturated fat and sugar, possibly explaining its protective role against T2D.

The researchers acknowledge that previous studies on chocolate and diabetes have yielded inconsistent results, often not distinguishing between chocolate types. This study fills that gap by differentiating between dark and milk chocolate and considering their specific effects on diabetes risk.

This study adds to a growing body of evidence suggesting that small dietary choices, like opting for dark chocolate over milk chocolate, can have meaningful health impacts. It underscores the potential of mindful eating in the prevention and management of chronic diseases like type 2 diabetes.

https://www.sciencedaily.com/releases/2024/12/241204183114.htm

Prenatal nutrition should address the needs of the modern parent, industry experts highlight

28 Nov 2024 | By Milana Nikolova

Expectant mothers are becoming older, more educated, and more affluent. This shift has led to an increased focus on prenatal nutrition.

Experts from various nutrition companies like Balchem Human Nutrition & Health, dsm-firmenich, Kaneka Nutrients Europe, and Gnosis by Lesaffre share their insights on this growing category.

Choline and Folate are essential for fetal brain development and cognitive function. Adequate folate in diets can reduce the risk of neural tube defects in babies. 52% of pregnant women in the US do not get enough folate from their diets. Choline intake often doesn't meet recommended levels. Combination of choline and folate is more bioavailable than folic acid and supports effective methylation, which is vital for DNA formation and cell division.Choline is well-researched and provides lasting cognitive health benefits for babies.

Omega-3s, particularly DHA and EPA, are crucial for reducing preterm birth rates and supporting maternal health.A 2018 Cochrane review demonstrated that omega-3 supplementation could reduce preterm births by 11% and early preterm births by 42%. New clinical guidelines recommend specific intake levels for women of childbearing age and pregnant women.dsm-firmenich is developing algal-derived omega-3s, including Life's Omega B54-0100, which offers a highly concentrated form of DHA.

Ubiquinol is vital for reproductive health due to its role in cellular energy production. It enhances fertility potential by improving egg quality, conception potential, and embryo development. Kaneka Ubiquinol has been shown to support mitochondrial energy production and

normalize reproductive hormone levels, significantly improving fertility outcomes.

Folate is crucial during periods of high cell growth, such as pregnancy and lactation. Quatrefolic, a form of 5-MTHF, bypasses the conversion step needed for folic acid, making it more effective, especially for individuals with MTHFR polymorphism. Folate helps manage homocysteine levels, which are important for preventing complications like neural tube defects and pre-eclampsia.

The growing market for prenatal health supplements is driven by increased awareness and interest in nutrients that support fetal brain development, reduce preterm birth rates, and enhance fertility. Innovative products like folate, Choline, and algal-derived omega-3s are helping to meet these nutritional needs.

https://www.nutritioninsight.com/news/prenatal-nutrition-should-address-the-needs-of-the-modern-parent-industry-experts-highlight.html

Wellness trends 2025: year of brain food, oral microbiome, fertility and functional teas

20 Nov 2024 | By Benjamin Ferrer

Holland & Barrett's latest trends report reveals top themes in supplement shopping and wellness trends for the UK in 2025.

Metabolism-supporting products and natural, scientifically-proven functional foods are expected to lead the market. The term "longevity" emphasizes living well for longer, with Gen Z taking the lead in preventive health measures.

Brain health is gaining importance alongside body health, with products featuring brain-healthy ingredients emerging. Iodine supplements during pregnancy may support children's IQ scores, though 67% of women lack sufficient iodine intake."Psychobiotics," beneficial bacteria for cognitive function, and fermented products like kimchi and kefir are trending. Personalized solutions for older expectant mothers are appearing, with a focus on choline for fetal brain development.

Oral microbiome, the second most diverse microbial community in the body, is gaining attention. Products for oral health, such as toothpaste and mouthwash, are on the rise. Interest in fibre intake is growing, with consumers eating less than the daily target. Fiber-infused products like water are becoming popular.

Gen Z's focus on self-care is driving the market toward functional teas with innovative flavours and health benefits. Metabolic health encompasses more than weight loss, influencing energy levels, disease resistance, and skin regeneration. Ingredients like jojoba oil, rosemary extract, snail mucin, and algae are trending in eco-conscious skincare.

Bio-retinal, a plant-based alternative to synthetic retinol, is set to trend for stimulating collagen production and renewing skin. Holland & Barrett's report provides a glimpse into the future of health and wellness, highlighting the retailer's commitment to developing market-leading products and personalized solutions.
https://www.nutritioninsight.com/news/wellness-trends-2025-holland-barrett-forecasts-year-of-brain-food-fiber-fertility-and-functional-teas.html

Flavanol-rich cocoa and green tea can protect the body's vasculature from stress after high-fat food

20 Nov 2024 | By Benjamin Ferrer

A new study in Food and Function explored how drinking cocoa high in flavanols, alongside a fatty meal, can protect the vascular system from the stress caused by fatty food consumption.

Participants consumed a fatty breakfast with either a high-flavanol or low-flavanol cocoa drink and underwent a mental math test. The high-flavanol drink mitigated the negative impact of stress on vascular function.Found in fruits, vegetables, tea, nuts, and unprocessed cocoa, flavanols help regulate blood pressure and protect cardiovascular health.

High-flavanol cocoa prevented the decline in vascular function post-stress and fatty food intake, as measured by brachial flow-mediated dilatation (FMD).

Alkalization, a process used in chocolate making, reduces flavanols. High-flavanol cocoa had significantly more flavanols than low-flavanol cocoa. High-fat foods impaired oxygen delivery to the prefrontal cortex during stress, but cocoa flavanols didn't improve oxygenation or mood. Recommended flavanol intake: 400 to 600 mg/day, achievable with two cups of black or green tea or a mix of berries, apples, and high-quality cocoa.

Consuming high-flavanol foods during stressful periods can counteract some of the negative vascular effects of poor food choices, promoting better cardiovascular health.

https://www.nutritioninsight.com/news/research-finds-flavanol-rich-cocoa-and-green-tea-can-protect-the-bodys-vasculature-from-stress-after-high-fat-food.html

Early life sugar restriction reduces chronic disease risk for adults

06 Nov 2024 | By Jolanda van Hal

A new study published in Science found that a low-sugar diet for babies in utero and their first 1,000 days can reduce the risk of diabetes by 35% and hypertension by 20%.

Here's a summary:
The study analyzed the long-term health effects of sugar rationing in the UK during World War II. During rationing (1942-1953), daily sugar intake was limited to an average of 40 g, which doubled to 80 g after rationing ended.
Low sugar intake in utero and early life delayed diabetes onset by four years and hypertension by two years. Sustained sugar restriction provided greater health benefits.

Researchers used the end of sugar rationing as a natural experiment to compare health outcomes of those born before and after September 1953.Early interventions to reduce sugar intake can delay or prevent diabetes and hypertension, improving life expectancy and reducing healthcare costs. It's predicted that 1.3 billion people will have diabetes by 2050.

Experts emphasize reducing sugar consumption in early life to lower the risk of chronic diseases. The study's design and reliance on historical data make it challenging to demonstrate causality, but it underscores the significant risk of high sugar intake in early childhood.

Reducing sugar content in foods and drinks for children is essential to prevent chronic diseases, but caution is needed to avoid simply replacing sugar with sweeteners.

https://www.nutritioninsight.com/news/early-life-sugar-restriction-reduces-chronic-disease-risk-for-adults-new-research-flags.html

Scientists discover link between types of milk and risk of depression and anxiety

18 Dec 2024 | By Venya Patel

A new study in Frontiers in Nutrition suggests that consuming semi-skimmed milk may be associated with a lower risk of depression and anxiety, which are increasingly common among young people.

Here are the detailed findings:
The study followed 357,568 participants from the UK Biobank over a period of 13.5 years.The study examined the relationship between different types of milk (semi-skimmed, full-cream, and skimmed) and mental health outcomes.

Semi-Skimmed Milk: Linked to a lower risk of both depression and anxiety. The nutrient profile, including a balance of saturated and unsaturated fats, may support brain health by reducing inflammation and supporting serotonin and dopamine synthesis. Full-Cream Milk: Associated with a lower risk of anxiety, but with inconsistent effects on depression. Higher saturated fat content may contribute to neuroinflammation and depressive symptoms. Skimmed Milk: No significant relationship found with either depression or anxiety. Lacking sufficient unsaturated fatty acids, it offers fewer mental health benefits.

Research by the University of Oxford suggests that almond, oat, and soy milk offer the largest reductions in nutritional imbalances among milk alternatives.
Depression affects 3.8% of people worldwide, while anxiety affects 4%. These disorders contribute significantly to the global burden of disease and are tied to chronic physical conditions such as cardiovascular disease, diabetes, chronic lung disease, and chronic pain.

Characteristics of Milk Drinkers: Non-Milk Consumers: More likely to drink coffee. Full-Cream Milk Consumers: More likely to be male, have lower income, and be current smokers.Semi-Skimmed Milk Consumers: Less likely to eat vegetables and fruit, more likely to drink alcohol regularly.Skimmed Milk Consumers: More likely to be older, white, previous smokers, obese, and have hypertension, diabetes, and cardiovascular disease.

Researchers emphasize the significant role of diet in mental health. Dairy consumption is widespread, and previous studies have shown a link between high milk consumption and increased mental health symptoms.The study used a Mendelian Randomization analysis to suggest a potential causal relationship between milk consumption and mental health disorders.Although the study highlights a potential link, it does not demonstrate causality due to its design and reliance on historical data.Diet plays a crucial role in mental health, and consuming semi-skimmed milk shows promise in reducing the risk of depression and anxiety. However, further research is necessary to validate these findings and understand the biological mechanisms involved.
https://www.foodingredientsfirst.com/news/scientists-discover-link-between-types-of-milk-and-risk-of-depression-and-anxiety.html

Food & Beverage Reformulation to Make Nutrition Affordable

Donna Eastlake Food Navigator Europe 4 Nov 2024

Global obesity numbers are increasing, and malnutrition due to poor diet is also on the rise.

High cost remains a major obstacle for consumers in accessing healthy foods. Larger food manufacturers are reformulating products to make them healthier and more affordable. This includes reducing added sugars, saturated fats, and sodium, and adding vital nutrients to products. There is a growing demand for healthier foods, driven by consumer concerns about gluten, dairy, sugar, and GMOs.

Larger manufacturers are helping smaller brands with reformulation efforts. Governing bodies are encouraging brands to reformulate through nutritional labelling schemes like non-HFSS and Nutri-Score.Reformulation is complex and costly, with issues related to texture, taste, and increased product cost.Healthy drinks, snacks, and ready-to-go meals are especially popular due to busy lifestyles.

Overall, the F&B industry is making significant efforts to improve the affordability and accessibility of healthy nutrition.

https://www.foodnavigator.com/Article/2024/11/04/food-and-beverage-reformulating-to-make-nutrition-affordable/

FOOD SCIENCE & INDUSTRY NEWS

Extending shelf life: Sustainability and convenience drive innovation amid evolving consumer demands

27 Nov 2024 | By Insha Naureen

The article discusses the latest innovations in extending the shelf life of food products, driven by consumer demands for sustainability and convenience.

Recent product recalls and the desire for exotic food imports without e-numbers are driving innovations in shelf-life extension. Consumers prioritize reduced food waste and environmentally friendly packaging. Innova Market Insights data shows a 5% growth in F&B launches using preservatives to extend shelf life from October 2019 to September 2024. Europe leads the market, with the bakery category dominating.

Brands are adopting natural antioxidants, antimicrobial blends, and high-pressure processing to preserve food quality. Companies like Kerry, Kalsec, Corbion, IFF, and Layn Natural Ingredients are leading these innovations.High-Pressure Processing is being used to extend shelf life while maintaining food quality.

Extending shelf life is crucial for reducing food waste and achieving sustainability goals. Up to 90% of the food industry's carbon footprint can come from scope 3 emissions, which include upstream and downstream supply chain activities. The demand for sustainable packaging is challenging manufacturers to develop solutions that extend shelf life while effectively using environmentally friendly materials.

There is a shift towards consumer-centric ingredient usage, with an emphasis on delivering healthful, transparent ingredients that align with consumer values. The pressure to avoid e-numbers and maintain clean labels presents challenges for formulators who want to align with consumer expectations without compromising product stability or safety. The future of shelf-life extension includes advancements in processing technologies, natural preservative ingredients, and enhanced functional packaging. AI and predictive analytics are expected to play a significant role in future innovations.

Developing new products for export markets becomes more feasible with extended shelf life, opening up new revenue streams and enhancing competitive edge. Using smart algorithms and data to predict shelf life and prove pathogen inhibition can make it easier for the industry to reformulate with food safety in mind.

https://www.foodingredientsfirst.com/news/extending-shelf-life-sustainability-and-convenience-drives-innovation-amid-evolving-consumer-demands.html

Savory ingredient specialists serve up nutritional solutions for globalized markets

20 Nov 2024 | By Joshua Poole

As consumer demand for healthier and more sustainable savoury food options continues to rise, food ingredients leaders are faced with both challenges and opportunities in the competitive global market.

With a focus on developing clean label solutions that prioritize taste and texture, companies like Lucta and ADM are exploring innovative approaches to meet evolving consumer preferences. From creating plant-based meat flavours to reducing salt content and exploring novel ingredient combinations, the savoury food space is ripe for experimentation and creativity.

By navigating regulatory restrictions, rising food prices, and changing consumer preferences, these companies are not only meeting current demands but also paving the way for future trends in the industry.

As the world looks towards a more sustainable and health-conscious food future, leaders in the savoury ingredients space are stepping up to the plate to deliver exciting and flavourful solutions.

In response to the increasingly health-conscious consumer demands, companies are focusing on providing high-quality plant-based ingredients and savouryflavours to satisfy the needs of those following vegetarian, vegan, or flexitarian lifestyles. As the plant-based market continues to gain prominence, the need for flavouring alternative proteins is becoming more important to enhance palatability and meet consumer expectations. In the coming years, the savoury ingredients market is expected to evolve to meet the demand for cleaner labelling and health claims in Western markets.

Additionally, there will be an increase in demand for customized meat and flavour profiles that appeal to diverse global tastes, particularly in emerging markets like Asia, the Middle East, and Africa. Consumers will also continue to seek more protein intake through savoury products, sweet foods, and beverages, driving the need for authentic, bold flavours in a variety of cuisines, both meat- and plant-based. With a focus on innovative savouryflavour solutions and enhanced protein functionality, companies are prepared for the expected growth in demand for alternative proteins in the global market.

https://www.foodingredientsfirst.com/news/savory-ingredient-specialists-serve-up-nutritional-solutions-for-globalized-markets.html

Chocolate consumer motivations to drive innovation

22 Nov 2024 | By Anvisha Manral

As consumer expectations around chocolate continue to evolve, AAK is at the forefront of understanding the drivers behind chocolate consumption.

With insights from a global study involving 7,500 consumers, the company is able to identify core motivations that influence consumers' choices when it comes to chocolate. Marieke Otten, head of Insights & Strategic Marketing, highlights the reasons why people buy chocolate, including wanting to experience great taste, indulge, share a moment, and enhance their mood.

The study's segmentation model provides valuable insights into different consumer segments and their behaviours and preferences related to oils and fats, which are essential components in chocolate production. By understanding these motivations and preferences, marketers and product developers can create targeted strategies and innovations that cater to the specific needs of each consumer segment, ultimately leading to more successful and satisfying chocolate products.

With sustainability becoming a key factor in consumer decision-making, chocolate brands are faced with the challenge of satisfying consumers' desire for indulgence while also being environmentally conscious. Research has identified a segment of consumers known as the "mindful indulgers" who prioritize sustainability and wellness in their purchasing decisions. Understanding regional and cultural preferences is also crucial for success in the global chocolate market.

Study reveals that trends vary by geography, age, and income, highlighting the need for industry partnerships to develop products that cater to diverse consumer preferences. Moving forward, there are ample opportunities for innovation in the chocolate industry, with potential for products targeting specific trends and consumer needs such as premium chocolate, cleaner ingredients, healthier options, and unique textures. By staying attuned to consumer preferences and trends, chocolate brands can continue to thrive in a competitive market while also promoting sustainability and wellness.

https://www.foodingredientsfirst.com/news/webinar-preview-aak-unpacks-chocolate-consumer-motivations-to-drive-innovation.html

Texturizing solution to improve dairy and fresh fermented foods

18 Nov 2024

Texstar is just one example of how companies like IFF are continuously innovating to meet consumer demands for healthier, more sustainable food products.

By providing a solution that not only improves texture and taste but also addresses supply chain issues and reduces carbon emissions, IFF is paving the way for a more environmentally friendly and consumer-conscious food industry.

In addition, IFF's Diazyme NOLO enzyme solution is another example of how the company is staying ahead of industry trends. With the rising popularity of NOLO beverages, IFF's enzyme solution offers a way for manufacturers to enhance their products without compromising on taste or efficiency. This kind of innovation highlights the importance of companies like IFF in driving positive change within the F&B sector and meeting the evolving needs of consumers around the world.

https://www.foodingredientsfirst.com/news/iff-launches-texturizing-solution-to-improve-dairy-and-fresh-fermented-foods.html

Soy protein to improve taste and texture in plant-based meat and fish

14 Nov 2024

ICL Food Specialties and DAIZ Engineering have joined forces to create RovitarisSprouTx, a soy protein aimed at addressing sensory challenges in the plant-based meat and seafood sector.

This innovative ingredient is produced using proprietary germination technology to develop textured soy proteins that improve taste, texture, and nutritional properties compared to current plant-based protein options. RovitarisSprouTx is set to be commercialized for distribution in 2025. The germination technology employed by DAIZ Engineering enhances the soy protein's taste and texture, eliminating the characteristic "beany" or bitter taste commonly associated with soy proteins. This development allows formulators to create better-tasting plant-based meat and seafood products.

It offers improved nutritional properties, making it a superior choice for plant-based protein options. The partnership between ICL Food Specialties and DAIZ Engineering highlights the transformative potential of this product for the industry, addressing various issues faced by manufacturers, including affordability.

In the broader context of the plant-based protein industry, innovation and research continue to gain momentum. Finnish food tech start-up Happy Plant Protein has raised €1.8 million (US$1.9 million) to commercialize its manufacturing process, which produces plant ingredients from legumes such as peas, lentils, and cereals, with a protein content of 70-80%.

Overall, these advancements reflect the rising global demand for sustainable protein solutions and signify a positive shift in the plant-based protein industry, aiming to provide consumers with better-tasting and more nutritious alternatives to traditional meat and seafood products.
https://www.foodingredientsfirst.com/news/icl-food-specialties-develops-soy-protein-to-improve-taste-and-texture-in-plant-based-meat-and-fish.html

Plant-based beverages with innovation “beyond mimicking dairy”

14 Nov 2024 | By Insha Naureen

dsm-firmenich innovations targeting dairy-like taste and texture in plant-based milk with two innovations—Smart Milk range and Dynarome DA technology.

Mimics “creamy, buttery, and rich” milky notes, designed to replicate the indulgent flavours of traditional dairy. Masks off-notes in dairy alternatives like oat, pea, and other plant proteins, ensuring smooth, clean, and delicious flavours. The company has identified a significant market gap for authentic dairy-like experiences in plant-based beverages. Their innovations aim to fill this gap by offering flavours that consumers love without compromising on nutrition or values. These advancements come at a time when the alternative dairy and meat product launches are increasing globally.

According to Innova Market Insights data, these launches have seen a +10% CAGR (compound annual growth rate) from July 2019 to June 2024, with alt-dairy drinks accounting for 38% of these launches.

The innovations aim to mimic the mouthfeel of milk while offering a nutritional profile similar to traditional dairy, providing a healthier yet satisfying alternative. The Smart Milk range is based on expertise in SmartProteins, capturing the rich milky notes that consumers desire. Dynarome DA technology masks off-notes while offering the authentic mouthfeel of real milk.

Nearly 70% of consumers seek plant-based options that taste like true dairy, and 73% are willing to purchase more dairy alternatives if they feature a better nutritional profile. dsm-firmenich claims their solutions are uniquely positioned to fulfil market needs, focusing on sensory features such as creaminess and flavour rather than just nutrient content.

Dairy alternatives have expanded to include various bases such as almond, cashew, coconut, rice, and oat, moving beyond traditional soy milk. Dairy alternative drinks have seen a +60% increase, and spoonable non-dairy yogurts have doubled between 2015 and 2019, according to Innova Market Insights.

Overall, new innovations aim to redefine plant-based beverages by delivering authentic dairy-like flavours and textures while providing a healthier alternative that aligns with modern lifestyle goals.
https://www.foodingredientsfirst.com/news/dsm-firmenich-redefines-plant-based-beverages-with-innovation-beyond-mimicking-dairy.html

Consumers seek improved non-caloric sweeteners amid taste challenges

14 Nov 2024

Sugar is the top food item that US consumers want to reduce in their diets, but over 75% wish there were better-tasting, non-caloric sweetening products available, according to research commissioned by MycoTechnology.

Sugar is the top food item that US consumers want to reduce in their diets, with 58% of 1,110 respondents indicating they want to cut down on sugar intake over the next year. For consumers aiming to reduce sugar, taste is a major "pain point." Of those reducing sugar, 71% report doing so by limiting sweet foods, while 31% use non-caloric sweeteners.

Over 75% of consumers wish there were better-tasting, non-caloric sweetening products available. Seven out of ten consumers using non-caloric, naturally derived sweeteners express interest in new options. Additionally, 80% of consumers (both users and non-users) consider naturally derived, non-caloric sweeteners healthier than artificial ones.

MycoTechnology is scaling production of a sweet protein derived from honey truffles. Safety evaluations indicate that this protein is not allergenic or toxic and is fully digestible. The company employs innovative fermentation technologies to create a clean sweetness profile with proven safety, digestibility, and low cost-in-use.

This new solution addresses top consumer concerns, presenting an opportunity for food and beverage innovators to meet demands and stand out in the market. MycoTechnology claims this protein is the "first new naturally derived sweetener discovered in decades" and offers a clean label option for manufacturers.

An International Food Information Council survey indicates that one-third of US consumers changed their consumption habits between April 2023 and April 2024. Among this group, 10% increased their LNCS consumption, while 6% started consuming LNCS.Overall, MycoTechnology's research and innovations highlight a clear demand for better-tasting, natural, non-caloric sweeteners.

Their advancements in fermentation technology and production of sweet proteins from honey truffles aim to address consumer preferences and market needs, offering healthier and appealing sugar alternatives.

https://www.foodingredientsfirst.com/news/majority-us-consumers-seek-improved-non-caloric-sweeteners-amid-taste-challenges-flags-research.html

Unexpected flavour combinations and adventurous eating turn up the heat

11 Nov 2024 | By Insha Naureen

A significant majority of consumers (81%) now enjoy medium or above heat levels, as revealed by a Kalsec survey.

The rise of globalization and social media has facilitated the pursuit of new sources of heat, with 46% of global consumers following influencers or blogs dedicated to hot and spicy foods. Kalsec surveyed nearly 6,000 consumers online from the US, Canada, Brazil, Mexico, the UK, France, Germany, Italy, Australia, and China for its "Beyond the Burn" report.

Consumers are increasingly seeking adventurous spicy eating experiences, favoring different types of heat and flavors from various regions. A combination of hot and sweet flavors, termed "swicy," is becoming popular and is indicative of the trend towards trying different flavor combinations. Spicy flavors are appearing in a wide range of foods, including prepared foods, sauces, snacks, cheeses, and dairy products, showcasing the importance of heat to consumers.

Consumers showed interest in tangy (53%), salty (51%), and sour (48%) flavors combined with spicy. Global consumers are most interested in trying spicy flavors in sauces, instant noodles, and dips. The popularity of spicy foods varies by region, with the Asia-Pacific region consuming them the most frequently (four to five times a week). Specific peppers favored by regions include jalapeno in the Americas, cayenne in Europe, and Thai bird's eye chili in Asia-Pacific.

Nearly 65% of consumers are eating spicier foods today compared to a year ago, with an 8% increase in those consuming spicy foods two to three times a week since 2021. Early childhood introduction to spicy foods is linked to a preference for higher heat levels. Jalapeño, cayenne, and chipotle are popular choices, with Thai chili/bird's eye chili gaining popularity. Consumers perceive chili pepper-containing products as more innovative. Manufacturers should focus on combining heat with smoky, earthy, and tangy flavors for new product innovation.

Kalsec's report highlights the growing demand for spicier options, the role of globalization and social media in this trend, and the innovative opportunities for product developers to tap into consumers' adventurous tastes and preferences for heat in foods.
https://www.foodingredientsfirst.com/news/kalsec-hot-and-spicy-survey-unexpected-flavor-combinations-and-adventurous-eating-turn-up-the-heat.html

Ultra-Processed Foods Researchers Call for Collaboration

By Mary Ellen Kuhn July 15, 2024
Food Technology Magazine

The article highlights a discussion during the IFT FIRST session on the importance of understanding the health impacts of ultra-processed foods (UPFs) and the need for collaboration among researchers.

Here are the key points: Presenters reviewed the current scientific understanding of UPFs and their correlation with obesity and diet-related diseases. Most existing research has been epidemiological, and there is a need for studies that explore the causal mechanisms behind the health impacts of UPFs. Kevin Hall from the National Institutes of Health emphasized the importance of identifying the mechanisms by which UPFs affect health. He called for more research to explore causal pathways and mechanisms, rather than just debating the pros and cons of UPF consumption. Hall highlighted the value of collaboration among industry, government, and academia to conduct multidisciplinary research. He stressed the need for food scientists to engineer foods along different hypothetical pathways to better understand UPFs' impacts.

Julie Hess from the USDA-Agricultural Research Service shared findings demonstrating that it is possible to build a healthy diet composed of UPFs and that minimally processed foods can also be unhealthy. The panelists agreed that processed foods play an important role in food safety, shelf life, and diversity. They noted that processing makes

food more accessible, affordable, and enjoyable. However, it is crucial to understand the impact of specific foods and processing methods to make them healthier.

The session concluded with a discussion on the future of food processing and the need for a better understanding of how UPFs affect health. There is a consensus that while certain processed foods may contribute to diet-related diseases, more research is needed to find ways to make them healthier.helping producers simplify their development

Ultra-Processed Foods Researchers Call for Collaboration - IFT.org

McKinsey Health & Wellness report shows consumers expect effective, science-backed solutions

19 Nov 2024

This shift in consumer preference means that manufacturers need to adapt and innovate to meet this new demand.

This is the conclusion from a survey of consumers in China, the UK, and the US published in the latest health and wellness report from management consulting company McKinsey. The McKinsey Health & Wellness report indicates that consumers are increasingly seeking effective, science-backed solutions from food, beverage, and supplement companies.

Key insights from the report include:
The global wellness market is valued at approximately $1.8 trillion, driven by trends in women's health, weight management, and in-person fitness. Around 80% of respondents consider wellness a top priority, particularly among Gen Z and Millennial consumers who purchase more wellness products and services.

Consumers prefer effective, data-driven, and science-backed health and wellness solutions. There is a demand for convenient nutrition solutions, such as food subscription services and food-tracking apps, especially popular among Millennials.

Five leading trends are shaping the category: Health at home, Biomonitoring and wearables, AI-driven personalization, Clinical over clean claims & The rise of doctor recommendations.

Consumers are using at-home testing for vitamin and mineral deficiencies and cholesterol levels, leading to increased interest in supplements and healthier foods. One-third of respondents use monitoring or wearable devices, showing potential for brand partnerships in food, drink, and supplements that enhance health and wellness.

Clinical claims are becoming more important than "clean label" claims, with doctor recommendations being a significant influence on health and wellness decisions.

The report suggests that companies should focus on clinically proven products, using clinically tested ingredients, conducting third-party research, and securing recommendations from healthcare providers.

McKinsey Health & Wellness report shows consumers expect effective, science-backed solutions

How can food and beverage overcome declining consumer confidence.

By Donna Eastlake 01-Nov-2024
Last updated on 01-Nov-2024

Consumer sentiment in Europe has plummeted to its lowest in 2024, mainly due to financial strains and high inflation.

High inflation and falling real incomes have curtailed consumption. Tight monetary policy is now a major drag on household spending. The cost-of-living crisis is impacting consumers globally, not just in Europe. Consumers are switching to lower-cost private label products, which are seeing increased investment from retailers in terms of quality and variety.

Consumers are moving to more economical options, particularly in meat (e.g., switching from fish/beef to chicken/frozen pork)

and oils (e.g., from olive oil to sunflower oil).

Food and beverage companies can adapt by focusing on innovation, product diversification, and maintaining good value for money. Increased M&A activity can help larger brands diversify and streamline operations during economic downturns.

These challenging times present opportunities for growth and adaptation within the food and beverage industry.

https://www.foodnavigator.com/Article/2024/11/01/the-great-consumer-confidence-crash-is-hurting-fmcg-brands/

Culture and innovation converge to unlock India's nutraceutical potential

5 Nov 2024

The nutraceutical market in India is estimated to be worth $4 billion (€3.6 billion) with a compound annual growth rate (CAGR) of 14.2%.

Increased awareness of health issues and prevalent micronutrient deficiencies are major drivers of market growth. Addressing nutritional challenges is crucial for India's future growth and prosperity. Sandeep Verma, country head of the Consumer Health Division at Bayer India, emphasizes the importance of micronutrient supplements in achieving 100% nutrition for the nation.

Nutraceuticals are identified as key in preventing ill health by supporting immunity and overall wellbeing. Essential vitamins (A, C, D, folate) and minerals (selenium, zinc) are highlighted for their role in boosting immunity. Consumers prefer nutraceuticals devoid of additives and artificial agents. Companies are seeking collaborations with Indian companies specializing in wellness and dietary supplements. The pandemic has underscored the importance of immunity boosters and natural foods, creating opportunities for various forms of nutraceutical delivery.

India's fast-moving healthcare goods sector holds 1 to 2% of the global market share, with functional foods making up 60% and dietary supplements 40% of the market. Companies like Abbott and Nutrilitius are launching innovative products to address nutritional deficiencies and promote health. The pandemic led to a surge in demand for Ayurvedic products like ashwagandha and herbal kaadha. Notable product launches include Bio-Botanica's Ashwagandha 5404ST and Amway's Chyawanprash by Nutrilite.

Post-COVID-19, there is a high demand for nutraceuticals, but supply chain challenges persist. Changing global weather affects the yield of beneficial phytochemicals from plants. Rising incidence of chronic diseases and the ageing population drive interest in nutraceuticals for cholesterol lowering and weight management. Antioxidant supplements like vitamins C and E help combat oxidative stress and reduce the risk of chronic diseases. Nutraceuticals and dietary supplements tailored for specific demographic groups, such as the elderly, address unique nutritional requirements and support optimal health outcomes.

Increased awareness of health issues, innovative breakthroughs, and dietary education are driving the growth of India's nutraceutical market. Addressing nutritional challenges and leveraging global collaborations and investments can unlock the market's potential and improve the overall quality of life in India.

https://www.ingredientsnetwork.com/culture-and-innovation-converge-to-unlock-india-s-news125825.html

Packaging with starch: Thai firm offers tapioca-based thermo-plastic material as sustainable option for food industry

By Audrey Yow 12-Nov-2024

Thai Wah's innovative approach to creating sustainable food packaging using tapioca-based thermoplastic starch (TPS).

This initiative aligns with the company's focus on sustainability and aims to address environmental concerns such as plastic waste and microplastics in agriculture.

Tapioca-based thermoplastic starch resin used in agriculture, consumer goods packaging, and food packaging. Biodegradable and compostable, promoting a closed-loop solution from cassava cultivation to eco-friendly waste.

Cassava is grown, and starch is extracted to produce packaging materials.

After use, the packaging can break down into bio-compostable waste, enriching the soil and potentially being processed into compost or bio-gas for renewable energy. Increasing consumer demand and regulatory changes drive the need for sustainable packaging solutions, particularly in Europe and parts of Asia.

Roseco TPS is compatible with biopolymers and can be used for injection molding, extrusion, thermoforming, and blown and cast films, making it suitable for various packaging needs.

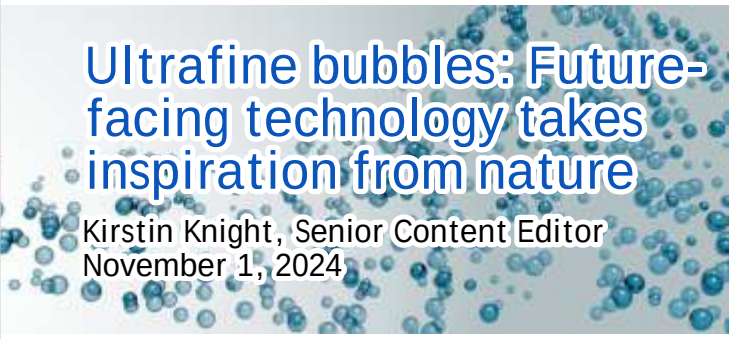
Already in use in Thailand's hotel, restaurant, and café industry. Plans to use TPS in instant noodle and ready-to-cook noodle kits, particularly for single-use items like forks and trays. Offers a sustainable alternative to polyethylene mulch films, which require manual removal.

Roseco mulch films can be tilled into the soil to biodegrade naturally. Roseco TPS resins are designed to meet strict environmental regulations, especially in Europe.

More than 90% renewable and compostable within 60 days. Currently 15-20% more expensive, but costs are expected to decrease with increased production. Growing interest in eco-friendly packaging solutions due to sustainability trends and concerns about microplastics.

Thai Wah's Roseco series can revolutionize the food packaging industry with sustainable, biodegradable, and compostable solutions. This aligns with global trends toward sustainability and addresses both consumer demand and regulatory requirements.

Thai firm offers tapioca-based thermoplastic material as sustainable option for food industry



Ultrafine bubbles: Future-facing technology takes inspiration from nature

Kirstin Knight, Senior Content Editor
November 1, 2024

The article discusses the potential of ultrafine bubbles, a technology inspired by nature, to revolutionize the nutraceuticals industry.

Ultrafine bubbles, which are already established in agriculture and cosmetics, offer promising applications for functional beverages and gut microbiome support.

Ultrafine bubbles were first discovered in the 1980s by researchers in Japan studying ocean waves.Hydrosome Labs uses a patented process based on hydrodynamic cavitation to create ultrafine bubbles around 100 nanometers in diameter.These bubbles can fit a trillion inside a single champagne bubble, highlighting their minuscule size. Nanoparticles at this scale have unique properties, making them excellent carriers for transporting and releasing drugs in specific body sites.Ultrafine bubbles enhance bioavailability and solubility of active substances, improving performance and reducing costs in consumer products.

Ultrafine bubbles have a long lifetime, governed by Brownian motion rather than buoyancy, allowing them to behave like particles in solution.The bubbles can last in solution for over two years and have a slight negative charge, attracting nutrients to their surface.The “attract and deliver” process improves the effectiveness of nutrient delivery to cells.

Hydrosome-led clinical trials have shown significant improvement in skin health with functional collagen beverages using ultrafine bubbles.Preclinical studies indicate that ultrafine bubble water can positively impact the gut microbiome, increasing short-chain fatty acids and reducing inflammatory markers.Ultrafine bubbles are already commercialized in cosmetics, demonstrating improved delivery of active ingredients through the skin.They have potential applications in flavor modulation and masking, particularly for sugar reduction and enhancing sweet taste.

The technology is relatively new, leading to varying levels

of acceptance and some negative press around nanotechnology. Education and awareness are key to overcoming skepticism and demonstrating the benefits of ultrafine bubbles. Hydrosome Labs plans to explore more applications, including enhancing stability in product formulations and addressing flavor profiles of challenging nutrients. The potential for ultrafine bubbles to better deliver nutrients opens up various degrees of freedom for product formulators.

Ultrafine bubbles: Future-facing technology takes inspiration from nature

When function meets convenience: how mood foods are shaping F&B NPD

By Deniz Ataman 13-Nov-2024

The article discusses how the trend of combining functionality and convenience in food and beverages is shaping new product development (NPD).

High-quality nutrients, ranging from vitamins and minerals to botanical extracts, are driving consumers' purchasing decisions. The line between function and form is blurring as brands develop products that deliver targeted health benefits and enhanced experiences.

Data from CPG Radar and Spate reveals that consumers are increasingly interested in functional ingredients that offer health benefits. CPG Radar's AI-driven platform provides insights into consumer-packaged goods, identifying 1260 functional beverages for this analysis. Spate's trend analytics platform uses AI to identify emerging consumer trends by analyzing online searches.

Fortified beverages with vitamins (B complex, C) and minerals (magnesium, zinc) are popular, making up 57% of top functional ingredients. Consumers seek to meet daily nutrient requirements while supporting immunity, bone health, and energy levels. Botanical extracts constitute 22% of top ingredients in functional beverages. Rhodiola, ashwagandha, ginseng, and turmeric are favored for their adaptogenic, nootropic, anti-inflammatory, and antioxidant benefits. Turmeric coffee and calming teas with herbs like spearmint are gaining traction.

Consumers are interested in performance-enhancing and wellbeing products. Searches for fat-burning coffee have increased by 382.2% year-over-year.Adaptogens in beverages are targeting metabolic health and immunity resilience. Mushrooms make up 9% of top functional ingredients in wellness beverages. Lion's mane, reishi, and cordyceps are recognized for their cognitive and overall health benefits. Prebiotics and probiotics support digestive wellness, with an 82.7% growth in searches for related products. Kombucha and other functional beverages often include these ingredients.

Natural sweeteners like stevia, monk fruit, and erythritol are preferred for their ability to enhance taste without adding calories, accommodating low-calorie or low-carb diets. Increased searches for zero-calorie snacks indicate consumer preference for guilt-free indulgence. Juices from nutrient-dense fruits and vegetables (e.g., pomegranate, acerola cherry, beet) are popular for their vitamins, minerals, and antioxidants. These juices contribute to immune support, improved circulation, and skin health.Caffeine sources like green tea, coffee, and yerba mate make up 19% of top functional ingredients. They are staples in energy drinks for focus-enhancing and performance-boosting effects.

The convergence of function and convenience in food and beverages is driving innovation in the industry. Brands are developing products with high-quality nutrients that offer targeted health benefits, meeting the growing consumer demand for functional foods and beverages.

https://www.foodingredientsfirst.com/news/plant-based-alternatives-found-to-match-or-surpass-animal-products-nutritionally-worldwide.html

Herbs, spices, and fruit: Bold flavours driving soda innovation

12 Nov 2024

The soda market is indeed embracing some adventurous flavours.

Brands are experimenting with unconventional flavours like basil, ginger, cumin, and even masala.

Mediterranean-inspired profiles are gaining traction, offering a sophisticated soda experience. Consumers are increasingly drawn to sodas that combine fruit bases with herbal twists, reflecting a desire for both taste and wellness benefits. Spices like cumin and masala are popular in regions like India, though they remain niche in the global market. Despite the interest in herbs and spices, traditional fruity flavours like raspberry, pear, peach, pineapple, and grapefruit continue to dominate the soda market.

Soda manufacturers are relying on limited-time releases to introduce new flavours without long-term commitments. Coca-Cola's Creations platform is an example, producing unique flavours like Coca-Cola Starlight and Coca-Cola Dreamworld.While consumers are open to experimentation, not all flavour innovations succeed. Coca-Cola's Spiced, a raspberry and spice-flavoured soda, was discontinued due to a lack of broad appeal.

The future of soda innovation lies in balancing adventurous flavours with consumer familiarity. Novel pairings like citrus with herbs or berry with spices are expected to gain more attention. While bold innovation is crucial, it must align with consumer preferences to ensure success. You can read the full article here.

Herbs, spices, and fruit: Bold flavours driving soda innovation – but not without risk

Fusion focus: Italian food with a Japanese twist key for frozen food firm's SEA expansion

By Audrey Yow 18-Nov-2024

Japanese-based Italian food brand Amici aims to fuse Italian and Japanese culinary traditions as it seeks to export frozen products to South East Asia.

Amici has been serving Italian cuisine since 2007 at its two trattorias in Ibaraki, Japan. In 2021, it expanded into producing frozen ready-to-eat Italian staples for supermarkets. To compete in broader Asian retail markets, Amici plans to blend Japanese elements into Italian cuisine. The brand is strategizing and gathering feedback from events like Food Japan 2024 to develop new recipes. Amici imports key ingredients like tomato sauce and cheese from Italy to ensure an authentic taste, while sourcing other ingredients from Japan.

Amici chef Yuji Ota suggests using Japanese rice flour instead of traditional Italian pizza flour. Adding shoyu and miso paste to pastas and pizzas for an umami boost and authentic Japanese flavour. Considering flavours like matcha or adzuki for fried pizza (pizza fritta), a lesser-known cousin of traditional Italian pizza. The fillings are enclosed within the dough.

Amici is testing its products in Singapore, a suitable Asian hub due to its diverse population and established demand for Japanese cuisine. Singapore also provides an opportunity to develop halal-friendly products, supporting expansion into other SEA markets with significant Muslim populations. Amici aims to balance authenticity with local tastes to broaden its appeal across diverse markets in the region. The fusion of Japanese and Italian cuisines is expected to capture market interest in South East Asia's ready-to-eat market.

https://www.foodnavigator-asia.com/Article/2024/11/18/italian-food-with-a-japanese-twist-key-for-frozen-food-firm-s-sea-expansion/

Umami Cola shakes up soda drink category with unique flavour

18 Nov 2024

Japan's Umami Cola is a koji-sweetened, botanical-based soda positioned as a natural energy drink.

It taps into trends for fermented food, drink, and natural energy.

Launched in 2020, the drink is non-alcoholic, non-caffeinated, additive-free, and marketed based on the 'koji amazake' concept—a nutrient-rich, non-alcoholic fermented Japanese drink made from rice koji and steamed rice. Umami Cola is made from rice koji and water.

Sweetness comes from the remaining starch in rice, avoiding additional sugar. The drink contains over 350 types of nutrients, including B vitamins and nine essential amino acids. It's low in calories (40 calories per 100 mg) and designed as a healthier alternative to typical energy drinks.

Available in medium (250 ml) and large (720 ml) sizes, both need to be diluted to create the cola. The design features an upside-down print to prompt consumers to invert the can before drinking, ensuring the ingredients mix well. The medium variety can be diluted to produce four to seven cups of cola, while the large version can be diluted to produce eleven to 20 cups. The Meimetsu variety uses caramelized syrup, orangettes, and has a distinctive osmanthus scent.

Targets busy, on-the-go consumers looking for better-for-you beverages with its nutrient-rich profile. Celebrated at the Topawards Asia 2024 for highlighting ingredients with a modern design. Faces competition from leading Japanese brands like Iyoshi Cola, Toba Toba Cola, Izumo Spice Lab, Tomo Cola, and Spring Water Kihada Cola. Cola is the most popular carbonated soft drink in Japan, with almost 40% of respondents naming it their favorite as of August 2021. The rise in sober curious lifestyles has increased interest in soft drinks.

Health awareness led to stagnation in carbonated soft drink consumption in Japan, but new flavors, unusual combinations, and limited editions are appealing to younger consumers. Japanese-inspired umami products are expanding into global markets, driven by interest in Japanese food Washoku and health/environmental awareness.

Umami is a crucial flavor for new food products. According to Innova, "savoring the contrast" is one of the top five global flavor trends for 2024.Umami Cola hopes its unique formulation and packaging will help it stand out on physical and online shelves, appealing to consumers with its innovative approach and health benefits.
Umami Cola shakes up soda drink category with unique flavour

Consumers increasingly turn to food for 'emotional wellness'

08 Nov 2024 Food Ingredients First By Benjamin Ferrer

Emotional wellbeing is becoming a top health concern for consumers across generations, with many preferring to manage their moods with food, beverages, and supplements rather than over-the-counter and prescription medications.

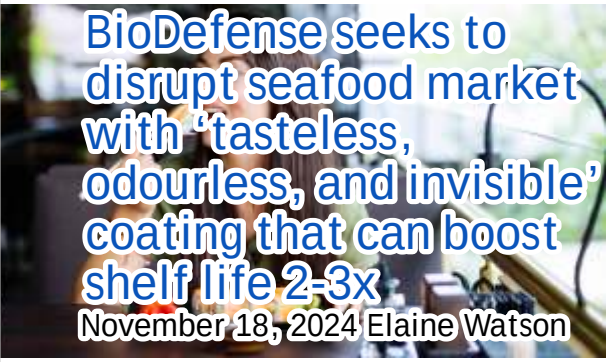
90% of over 3,400 US adults surveyed agreed that mental and emotional balance is as important as physical health.25% listed emotional health as a top health priority, just behind energy (26%) and sleep (32%). Weight management was the most cited priority at 45%.48% are taking steps to improve emotional health, and 52% are addressing it to prevent future problems.20% use foods or beverages naturally helpful for emotional health, and 15% rely on functional foods and beverages.These figures are higher than the 6% using over-the-counter drugs and 16% using prescription drugs for emotional health.

There is a growing preference for using food over drugs to manage emotional health, creating opportunities for innovative brands.Functional foods, beverages, and supplements with stress-supporting and calming benefits (e.g., botanicals, adaptogens, medicinal mushrooms, THC, CBD) are gaining popularity.Daily GEM offers nutrient-dense "Bites" designed for daily health and targeted emotional needs, made with plant-based ingredients and "real food."The GEM Bite includes over 20 vitamins, minerals, probiotics, and prebiotics.Add-On Bites provide extra support for energy, relaxation, and sleep. Emotional health is challenging to manage, and the connection between diet and emotional health is less clear than other health aspects.Half of consumers use hot tea, and 36% use ready-to-drink tea for emotional health benefits. Chocolate or candy bars are also popular for emotional support.

Cognition is a lower priority, with 38% taking steps to improve or prevent problems. Ready-to-drink energy beverages and hot tea are commonly consumed for cognitive benefits.

62% are interested in new functional foods supporting cognition, with affordability, clinical results, and trusted recommendations being important factors. There is significant room for innovation in the food-as-mood space, with potential to address needs like recovery, eyesight, and mental capacity.

Soup-to-Nuts Podcast: Consumers seek 'emotional wellness' from food



BioDefense seeks to disrupt seafood market with 'tasteless, odourless, and invisible' coating that can boost shelf life 2-3x

November 18, 2024 Elaine Watson

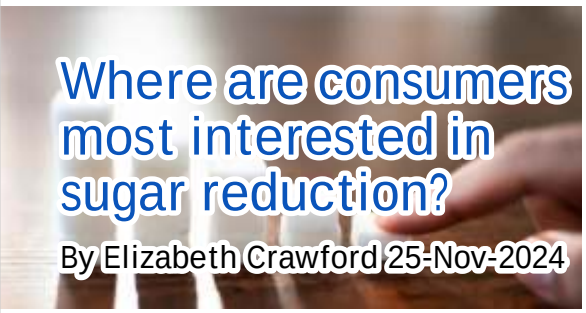
BioDefense, a Singapore-based startup, has developed odourless, colourless, and tasteless edible coatings that can extend the shelf life of whole fish, fillets, meat, poultry, and fresh produce.

Founded by Dr. Amit Kumar and Dr. Sheetal Sinha in 2021, the company aims to revolutionize the seafood market by significantly reducing waste and enhancing food quality.
The journey began with proving that BioDefense's edible coatings did not negatively impact taste or texture.Initial shelf-life extension was 1.6x to 1.7x, now improved to 2-3x.While there are edible coatings for fruits and vegetables, the opportunity in meat, fish, and seafood is larger due to higher value and greater waste impact.Provides a slight sheen, making products look more appealing. Keeps fish fresher and retains flavor compounds and nutrients. Components in the formulation work synergistically to create a significant anti-microbial effect.

Coating Can be applied by dipping or spraying. Coating can be kept at room temperature for several weeks, longer if refrigerated. Plans to provide tablets to mix with water on-site to reduce logistics costs.Regulatory approval is being pursued in Singapore, India, Thailand, Vietnam, and Indonesia. Future plans include Europe and the United States. Shelf life extended from two days to seven days. Shelf life extended 2x to 2.5x, from two days to four or five days.

Successful implementation at customer sites, confirming the potential business value. Maintaining consistent operations, achieving the desired shelf-life extension, and navigating the VC ecosystem that favors frontier technology.BioDefense is set to disrupt the seafood market by extending the shelf life of perishable food commodities, benefiting both businesses and consumers by reducing waste and improving food quality.

https://agfundernews.com/biodefense-seeks-to-disrupt-seafood-market-with-tasteless-odorless-and-invisible-coating-that-can-boost-shelf-life-2-3x



Where are consumers most interested in sugar reduction?

By Elizabeth Crawford 25-Nov-2024

Eight in ten consumers globally are limiting sugar in their diets.

Reasons for cutting back on sugar and areas of indulgence vary, as do the values they prioritize such as taste, clean label, and overall nutrition. ADM's research, involving nearly 14,000 people across 15 countries, shows that on average 83% of consumers are reducing sugar intake, pressuring manufacturers to reformulate products strategically. This tool was introduced to help companies understand where sugar reduction will have the most impact. It provides insights on balancing sugar reduction with other consumer demands.

Consumers exhibit dynamic behaviour regarding sugar reduction. The same consumer may choose a full sugar beverage at one meal and a sugar-free option at another time. Research considers the effects of innovation, regulations, and legislative efforts like sugar taxes and warnings on sugar-sweetened items, which influence consumer behaviour. The tool reveals regional differences: North America: 66% interest in reducing sugar in non-alcoholic beverages, 61% in sauces & dressings, 60% in bars and snacks, 56% in baked goods, 54% in dairy, and 44% in candies and chocolate. Latin America: 88% interest in sugar reduction in non-alcoholic beverages, 86% in dairy, and 84% in baked goods.

It supports brands in "replace, rebalance and rebuild" efforts when reducing sugar. They recommend companies

consider brand parameters, calorie reduction goals, and the level of involvement in the reformulation process.
https://www.foodnavigator-usa.com/Article/2024/11/25/adm-uncovers-where-consumers-are-most-interested-in-sugar-reduction/

Coconut creations: Sokfarm taps rising sodium reduction trends and production advantages for new soy sauce alternative

By Pearly Neo 19-Sep-2024

Company taps rising sodium reduction trends and production advantages for new soy sauce alternative.

Vietnam-based Sokfarm has developed a new soy sauce alternative called aminos, which taps into the rising demand for reduced sodium consumption and the natural production advantages of coconut nectar.

The aminos soy sauce alternative is made from coconut nectar and sea salt, making it a soy-free and gluten-free option, suitable for those with allergies. This product contains 50% less sodium than conventional soy sauce and adheres to clean label standards with organic ingredients. Aligns with ongoing health and wellness trends, particularly the increasing demand for sodium reduction in foods and beverages.

The coconut nectar is sourced from the Tra Vinh province in the Mekong Delta, which has a high concentration of sea salt. Due to rising sea levels, some coconut trees only flower but do not fruit, making the nectar naturally saltier and ideal for aminos production. There is significant international market interest, especially in regions that lack domestic coconut production like the EU, Australia, and Japan. The product also fits well within the vegan and plant-based product trends.

Sokfarm sees potential in Shanghai due to the high acceptance of soy sauce in the Chinese market. The company also exports to Japan, Germany, the Netherlands, the United States, and Australia, with eyes on Poland, South Korea, Singapore, Taiwan, and China. The coconut blossom sap is abundant and sustainable, with one hectare of coconut trees producing around 60 tonnes a year, making this a viable and sustainable sector. Sokfarm's aminos soy sauce alternative is poised to capture market interest due to its health benefits, clean label, and sustainability, along with the company's strategic approach to tapping into international markets.

https://www.foodnavigator-asia.com/Article/2024/09/19/sokfarm-taps-rising-sodium-reduction-trends-and-production-advantages-for-coconut-based-soy-sauce-alternative/

Taking oats from the breakfast bowl to the dinner table

21 Nov 2024

Stoked Oats is making waves by introducing OatRice, a novel oat-based rice alternative. Aimed at health and eco-conscious consumers, this product boasts five times the fibre of traditional white rice and double the protein. It can be cooked like rice—on the stovetop or in a multi-function cooker.

Simon Donato, the CEO and founder of Stoked Oats, aims to redefine how oats are perceived, taking them beyond their breakfast staple status. With growing trends in health and sustainability, 2024 appears to be the perfect year for this launch. The company is committed to being climate-positive and carbon-negative by 2025, using locally grown oats and Gold Standard Carbon Credits.

The rise of sustainability concerns is evident among consumers, particularly Gen Z, who prioritize environmentally friendly products. This shift in consumer preference is reflected in Stoked Oats' mission and product development.
In summary:OatRice: An oat-based rice alternative with higher fibre and protein content. It can be prepared on the stovetop or in a multi-function cooker. Locally grown oats, carbon-negative by 2025. Increasing demand for sustainable and health-conscious food options.

Taking oats from the breakfast bowl to the dinner table

REGULATORY NEWS

Scientists propose roadmap to unlock EU prebiotic health claims amid research gaps

19 Nov 2024 | By Jolanda van Hal

Scientists have proposed a strategic roadmap to gain regulatory recognition for prebiotic health claims in the EU, as currently, the term "prebiotics" is not authorized for health claims in the region.

The paper, published in Gut Microbes, outlines several key steps to achieve this goal: Prebiotic substances should be characterized under both in vitro (lab-based) and in vivo (living organism-based) conditions using advanced research methods. Selective microbiota modulation must be linked to a demonstrable physiological benefit. Proving the cause-and-effect relationship between the prebiotic effect on the microbiota and the physiological benefit is essential. Multiple clinical studies are necessary to establish this relationship.

The paper, authored by the Prebiotics Task Force from the International Life Sciences Institute (ILSI) Europe, resulted from a workshop organized in October 2023 with experts from academia, industry, and regulatory authorities. Co-author Elaine Vaughan, health science and regulatory affairs leader from Sensus, emphasizes the importance of regulatory guidelines by bodies like the European Food Safety Authority (EFSA) for consumer trust and stimulating innovation in healthier food products.

Although some prebiotic fibres, such as sugar beet fibre, have health claims, the term "prebiotic" is not authorized as a health claim by EFSA, which requires robust scientific evidence.The paper details that EFSA mandates documentation of a prebiotic-driven change in the microbiota that provides direct evidence of a physiological benefit in humans.

A well-substantiated health claim application needs at least two studies to investigate conditions of use, such as the required dose, bioavailability in the microbiota, and a plausible mode of action. Standardized protocols, validated biomarkers, and advanced data integration tools are urgently needed to support study designs.

The team aims to build a European health claims dossier linking prebiotics to various health benefits, highlighting cognitive, immune, metabolic, and digestive health as key research areas.Three current research gaps and documentation challenges are identified: mechanisms of action, structure/function relationship, and overall cause-and-effect on host health.

Some prebiotics, such as inulin, lactitol, sugar beet fibre, and rye fibre, have attained EU-authorized health claim status in digestive health. However, many applications have not yet succeeded due to the lack of established cause-and-effect relationships. There is growing research linking the gut to immunity, but insufficient evidence to meet an EU health claim for prebiotics' impact on the immune system.

Findings linking dietary fibres and specific prebiotics to metabolic health align with EFSA's recommendation for a high-fibre diet, but more knowledge is needed about the gut microbiota and short-chain fatty acids' modulating effects.

Studies support the gut microbiome's association with psychiatric and cognitive dysfunction, but mechanisms behind probiotic effects on cognition are poorly understood.

The paper concludes that more rigorous research, standardized protocols, and advanced data integration are crucial for achieving regulatory recognition for prebiotic health claims in the EU.

https://www.nutritioninsight.com/news/scientists-propose-roadmap-to-unlock-eu-prebiotic-health-claims-amid-research-gaps.html

New UK legislation mandates fortifying flour with folic acid to protect newborns

18 Nov 2024 | By Jolanda van Hal

The UK government has announced that by the end of 2026, millers and flour producers must fortify non-wholemeal wheat flour with folic acid.

This move aims to protect newborn babies from severe brain and spine problems, known as neural tube defects. The government estimates that this legislation will prevent around 200 cases of these defects annually and improve the health of pregnant women.

Health and Economic Benefits:The government expects the legislation to save around £20 million (US$25.3 million) for the National Health Service (NHS) and boost the economy by more than £90 million (US$113.7 million) over ten years.The measure is also expected to bring additional benefits to society, including an increase in live births, increased labour market participation, and prevention of parents leaving the labour market, totalling an estimated £664 million (US$838.6 million) in benefits.

Support and Criticism:Researchers and experts have welcomed the move, highlighting its benefits for pregnant women, infants, and the general population.Critics argue that the legislation is limited as it excludes wholemeal flour and rice, which means some groups, such as women sensitive to gluten, will not benefit.

Manufacturers have a 24-month transition period to adjust their processes to comply with the new legislation.The NHS currently recommends women trying to conceive take folic acid supplements for three months before getting pregnant and for at least 12 weeks after becoming pregnant.The government asserts that fortifying flour will provide women with a higher baseline intake of folic acid, especially since half of pregnancies in the country are unplanned.

The new legislation follows years of campaigning and several reviews by the Scientific Advisory Committee on Nutrition (SACN), which has recommended folic acid fortification since 2006.Joe Brennan of UK Flour Millers supports the initiative, noting that flour has been fortified with vitamins and minerals since the 1940s.Dutch food ingredient expert Corbion is developing folic acid-fortified corn tortillas to reduce neural tube defects. Despite the US FDA's approval, only 14% of corn masa flour products in 2023 contained folic acid.The Food Fortification Initiative highlights the need for increased food fortification globally to reduce micronutrient deficiencies, citing a successful wheat flour fortification program in India.

Experts like Neena Modi from Imperial College London and Dr. Jonathan Sher criticize the limited scope of the legislation, arguing that fortifying all flour and rice could prevent more neural tube defects.They note that excluding certain groups from benefiting may exacerbate existing health inequities in the UK.

In summary, the UK government's initiative to fortify non-wholemeal wheat flour with folic acid is a significant step towards improving public health and preventing neural tube defects. However, the exclusion of wholemeal flour and rice from the legislation has drawn criticism, highlighting the need for more comprehensive measures to address health inequities.

https://www.nutritioninsight.com/news/new-uk-legislation-mandates-fortifying-flour-with-folic-acid-to-protect-

Imagindairy secures regulatory approval to market animal-free milk proteins in Israel

27 Nov 2024 | By Anvisha Manral

Imagindairy, a food tech company specializing in animal-free milk proteins through precision fermentation, has received regulatory approval from the Israeli Ministry of Health to sell its products in Israel.

These milk proteins mimic the taste, texture, and nutritional value of cow milk-derived proteins but are produced without animal intervention. They can be used to make cheese, milk, yogurt, and ice cream and are free from cholesterol, lactose, and hormones.

Imagindairy has received approval from the Israeli Ministry of Health to market its animal-free milk proteins in Israel.The company previously received FDA approval in January, allowing access to the US market.The milk proteins mimic cow milk-derived proteins in taste, texture, and nutritional value.They can be used to produce various dairy products, including cheese, milk, yogurt, and ice cream.The products are free from cholesterol, lactose, and hormones.

The fermentation method used is environmentally friendly, lowering greenhouse gas emissions and land and water use.CEO Dr. Eyal Afergan mentioned that the company's advanced AI-based technology and manufacturing lines position it to offer animal-free products at cost parity with traditional dairy.Achieving cost parity has historically been a challenge in the precision fermentation sector, but the company is confident in reaching industrial scale.

Israel-based DairyX is also working on formulating cow-free casein protein micelles using precision fermentation techniques. This method targets the stretchy and protein-rich traits of dairy cheese and uses simple inputs like salts and sugars. The protein can be used in cheese, yogurt, and non-dairy products like lactose-free and vegan dairy alternatives.

Imagindairy's regulatory approval in Israel demonstrates the safety and quality of its animal-free milk proteins. This milestone not only opens new market opportunities but also supports the development of sustainable food solutions.

https://www.foodingredientsfirst.com/news/imagindairy-secures-regulatory-approval-to-market-animal-free-milk-proteins-in-israel.html

EFSA approves saccharin safety threshold increase following comprehensive review

18 Nov 2024 | By Elizabeth Green

The European Food Safety Authority (EFSA) has concluded in a new scientific opinion that saccharin is safe for human consumption and has increased the acceptable daily intake (ADI) from 5 to 9 mg/kg of body weight per day.

This ADI covers saccharin and its sodium, calcium, and potassium salts (E954). The previous ADI was set in 1995 based on the increased incidence of bladder tumours observed in rat studies. However, there is now scientific agreement that these tumours are specific to male rats and not relevant to humans.

EFSA experts reviewed all available data and concluded that saccharin does not cause DNA damage. It is unlikely that saccharin consumption is associated with cancer risk in humans. Consumer exposure to saccharin is below the newly derived ADI, meaning there is no health risk.

Saccharin has been used to sweeten foods and drinks for over 100 years, becoming popular in the '60s and '70s as a sugar replacement. The salts of saccharin are used because they dissolve better in water, making it easier to add to foods and drinks and enhancing sweetness. Saccharin and its salts must be labeled on products, allowing consumers to make informed choices. This re-evaluation is part of a broader effort to review the safety of all food additives permitted for use in foods before January 20, 2009, as required by EU regulations.

The Calorie Control Council issued a statement in response to EFSA's report. Carla Saunders, president of the Calorie Control Council, emphasized that this rigorous scientific review reinforces decades of research validating saccharin's safety and recommends an increased ADI, further endorsing its status as a trusted ingredient. She highlighted that saccharin remains a valuable tool for consumers to reduce sugar and caloric intake for healthier outcomes.

https://www.foodingredientsfirst.com/news/efsa-approves-saccharin-safety-threshold-increase-following-comprehensive-review.html

Samyang receives novel food approval for allulose use in Australia and New Zealand

14 Nov 2024

Samyang Corporation has received novel food approval for its alternative sweetener allulose in Australia and New Zealand, making it the first global producer to enter these markets. This approval allows Samyang exclusive supply rights in the region and aims to expand its market share through new distribution channels.

Allulose is now officially recognized as a "food ingredient" in Australia and New Zealand. Unlike high-intensity sweeteners and sugar alcohols classified as food additives, allulose can be used more freely to formulate sugar-reduced and sugar-free products. The Food Standards Australia New Zealand (FSANZ) granted the approval. The recent approval allows Samyang to expand its reach to Australia and New Zealand while continuing its market expansion in North America and Japan. The company plans to pursue promotions with new local clients and distributors to capture market share.

Samyang completed the construction of its specialty plant for manufacturing allulose and prebiotics in Ulsan, South Korea, in September. The plant has an annual production capacity of 13,000 metric tons and can produce both liquid and crystalline allulose suitable for export.

Allulose is a rare sugar with 70% of the sweetness of sucrose but nearly zero calories. It has a similar taste profile to fructose and creates a caramelization effect when heated, delivering a flavor profile like sucrose. Despite its benefits, allulose has low consumer awareness, with only 13% of respondents in a recent US-based survey having heard of it.Another South Korean company, Daesang, is preparing to create a market for allulose in Southeast Asia and Europe, aiming to register it as a novel food.

Australia's food market is growing steadily, driving demand for low-sugar, low-fat, and organic products. High obesity rates in Australia increase the likelihood of government support for alternative sweeteners. In New Zealand, wellness-related products, including organic and plant-based alternatives and free-from foods, are gaining traction, suggesting a promising outlook for the sugar-free market.

https://www.foodingredientsfirst.com/news/samyang-receives-novel-food-approval-for-allulose-use-in-australia-and-new-zealand.html

US researchers create AI-based “electronic tongue” to intercept milk and fruit juice contamination

12 Dec 2024 | By Insha Naureen

Scientists in the US have developed an "electronic tongue" that can identify differences in liquid samples using AI, such as milk with varying water content, soda types, and coffee blends.

The technology can also detect signs of spoilage in fruit juices and food safety concerns. Inspired by the human tongue's sensitivity to different foods, it aims to address issues like food adulteration and authenticity assurance.

The electronic tongue consists of a graphene-based ion-sensitive field-effect transistor or a conductive device that can detect chemical ions. It uses an artificial neural network trained on various datasets to classify food products. The technology combines graphene-based chemical sensors with AI to overcome challenges like sensor drift and variation. The AI accurately detects samples, including watered-down milks, different soda types, coffee blends, and multiple fruit juices at various freshness levels, with over 80% accuracy in about one minute. The technology can help detect milk fraud, identifying subtle changes in milk chemistry when water is added. The electronic tongue can also be applied to other products like grape juice, detecting toxins such as Patulin, and differentiating between different cola drink types.

The research, led by Saptarshi Das, professor at Pennsylvania State University, is related to neuromorphic computing and brain-inspired computing. The findings, published in Nature, highlight that the electronic tongue imitates the brain's gustatory cortex, which perceives and interprets different tastes beyond the basic categories of sweet, sour, bitter, salty, and savoury. The neural network is trained to assess 20 specific parameters related to how a sample liquid interacts with the sensor's electrical properties.

The electronic tongue can detect subtle differences in milk samples, even with added water, overcoming the difficulty of visual and chemical detection. AI helps resolve sensor drift issues by analysing subtle changes in device characteristics to classify different food products. The technology can be used to detect microbial faults in white wines and measure the aging of pineapple and orange juice with added preservatives. Efforts are ongoing to apply the electronic tongue to solid foods like spices, which face challenges like adulteration and authenticity issues.

The team aims to develop a handheld, low-power device for consumer use and an app to connect the device to cloud servers for food adulteration detection. The electronic tongue's AI-powered graphene technology has the potential to transform the food industry by ensuring product authenticity and safety.This innovative development holds promise for enhancing food safety, preventing adulteration, and ensuring the authenticity of various food and beverage products.

https://www.foodingredientsfirst.com/news/us-researchers-create-ai-based-electronic-tongue-to-intercept-milk-and-fruit-juice-contamination.html

US government moves to outlaw red food dye

10 Dec 2024 | By Anvisha Manral

The US Food and Drug Administration (FDA) is considering banning Red No. 3, an artificial food dye commonly used in snacks, cereals, candies, and beverages, which produces a bright cherry red colour. The FDA is reviewing a petition that invokes the Delaney Clause, which mandates the FDA to ban food additives found to cause or induce cancer in humans or animals based on testing.

Research has shown that Red No. 3, made from petroleum, could cause cancer in rats and is linked to other potential health issues such as ADHD in children.The FDA has assessed the safety of Red No. 3 multiple times since its approval in 1969.The FDA is actively reviewing a petition filed for FD&C Red No. 3, which is authorized for use as a colour additive in food and ingested drugs.Under the Delaney Clause, the petition obligates the FDA to repeal the colour additive regulations that permit using Red No. 3 in foods, including dietary supplements.

Senator Tommy Tuberville and House Energy and Commerce Committee ranking member Frank Pallone Jr. have urged the FDA to take immediate action against using Red No. 3 in food products.Pallone argues that the chemical is used to entice and mislead consumers by changing the colour of food to make it more appealing.

California became the first US state to ban Red No. 3 and multiple other food additives in 2023, with the law taking effect in 2027.Governor Gavin Newsom believes the timeline gives companies plenty of time to adapt to the new rules.The National Confectioners Association (NCA) has pushed back against the legislation, arguing that it undermines consumer confidence and creates confusion around food safety.

In summary, the FDA's potential move to ban Red No. 3 is driven by health concerns and regulatory requirements under the Delaney Clause. While some lawmakers and experts support the ban, industry bodies have expressed concerns about its impact on consumer confidence and food safety.

https://www.foodingredientsfirst.com/news/us-government-moves-to-outlaw-red-food-dye-amid-cancer-and-neurological-disorder-fears.html

UK health officials advance reforms to ban fast food and takeaway outlets from targeting children

16 Dec 2024 | By Gaynor Selby

Local authorities in England might ban new hot food takeaways and fast-food outlets from targeting children near schools and play areas as part of government obesity-related reforms.

Chief medical officer, Professor Chris Whitty, published a report outlining health opportunities and challenges in city populations, highlighting the concentration of fast-food outlets offering high-fat, sugar, and salt products, a high density of unhealthy food advertising, and limited shopping options.

The report highlights the complexity of the urban food system and notes differences in the food environment between affluent and deprived areas.It emphasizes the need to improve access to healthy food in cities.The Obesity Health Alliance welcomes the proposed reforms to the planning system to protect children's health.Local planning authorities are advised to refuse applications for hot food takeaways and fast-food outlets near schools and areas where children congregate.

Previously, councils were required to "enable and support healthy lifestyles."The new policy explicitly prioritizes preventing ill health, giving councils more power to act in their communities' best interests.Research indicates that exposure to more takeaways is associated with unhealthy dietary habits.Areas of deprivation have a higher concentration of fast-food outlets, high-density unhealthy food advertising, and limited shopping opportunities.

Children in deprived areas are twice as likely to develop obesity by age five and one in three by the time they leave primary school.Fast food outlets are disproportionately clustered in these areas, making healthy choices more challenging and widening health inequalities.

Minister for Public Health and Prevention, Andrew Gwynne, supports giving local authorities the power to block applications for unhealthy takeaways near schools.Katharine Jenner of the Obesity Health Alliance emphasizes the need to change the food environment to promote good health and reduce inequalities.These reforms follow other measures to curb childhood obesity, including new guidelines on junk food advertising set to be enforced from October 2025.

In summary, the proposed reforms aim to protect children's health by restricting new fast-food outlets near schools and play areas, addressing the concentration of unhealthy food environments in deprived areas, and promoting healthier food choices in urban populations.

https://www.foodingredientsfirst.com/news/uk-health-officials-advance-reforms-to-ban-fast-food-and-takeaway-outlets-from-targeting-children.html

Digital defence: Why APAC food firms are prioritising tech investments for food safety and traceability

By Pearly Neo 30-Oct-2024
Food Navigator Asia

Food and beverage companies across the Asia-Pacific (APAC) region are increasingly prioritizing investments in food safety and traceability technologies.

This trend is driven by rapidly evolving local needs, climate change, and the complexity of the region's food supply networks. APAC is home to some of the world's largest consumer markets, including China, India, and Indonesia, and has a diverse range of foods and cuisines, which heightens food safety risks.

The region faces three main food safety threats: microbiological hazards (e.g., salmonellosis), chemical hazards (e.g., toxins absorbed by plants and seafood), and physical hazards (e.g., contamination from natural disasters). Climate change exacerbates these issues by causing major temperature changes that affect food safety.

Companies are turning to technology to improve visibility and traceability in the food supply chain.

Technologies like blockchain and AI are becoming more accepted as firms recognize their long-term benefits in terms of convenience and cost savings.Regulatory agencies are increasing oversight, with large-scale testing and stricter regulations on contaminants and antibiotic use in food animals.Consumers are demanding greater transparency and accountability from food companies, driving the adoption of traceability technologies.

There is a need for standardized data protocols and enhanced interoperability across the supply chain to improve efficiency and risk management.New technologies, such as molecular tracing solutions, are being developed to trace the actual food itself, beyond traditional methods like barcodes and RFID.

In summary, APAC food firms are investing in advanced technologies to address food safety and traceability challenges, driven by regulatory requirements, consumer demand, and the need for greater transparency in the food supply chain

https://www.foodnavigator-asia.com/Article/2024/10/30/Why-APAC-food-firms-are-prioritising-tech-investments-for-food-safety-and-traceability/

Nutri-Grade labelling expansion to include sodium and sat fat likely 'to be effective'

By Audrey Yow 06-Nov-2024
Food Navigator Asia

The Singapore Ministry of Health (MOH) plans to extend Nutri-Grade labelling, which was previously applied to sugared beverages, to now include sodium and saturated fat.

This aims to help consumers make healthier choices by identifying products high in these nutrients. The expansion is expected to be effective in reducing sodium and saturated fat intake, similar to the success seen with sugared beverages. This is crucial given the rising prevalence of hypertension and hyperlipidaemia in Singapore.

The MOH and Health Promotion Board (HPB) have engaged with over 80 market leaders to discuss measures to reduce sodium and saturated fat intake. Many manufacturers have already started reformulating their products. While the new measures are anticipated to be effective, there are concerns about their implementation. The MOH plans to conduct further consultations with the food industry to ensure the measures are practicable and feasible.

The MOH and HPB will also step up public education efforts to inform consumers and food and beverage (F&B) operators about the importance of reducing sodium and saturated fat in food. Similar to the existing Nutri-Grade measures for sugared beverages, penalties for non-compliance may include fines of up to SGD 1,000 for the first conviction and up to SGD 2,000 for subsequent convictions.

https://www.foodnavigator-asia.com/Article/2024/11/06/nutri-grade-labelling-expansion-to-include-sodium-and-sat-fat-likely-to-be-effective/

Navigating regulatory claims for mood foods & functional ingredients

By Deniz Ataman 13-Nov-2024

The article discusses the regulatory challenges and considerations for brands marketing foods and ingredients aimed at mood management and functional benefits.

It highlights the importance of understanding functional claims, relying on strong scientific evidence, and staying informed on emerging trends to market products effectively and compliantly. The functional food and beverages market is expected to grow from $364.18 billion in 2024 to $793.60 billion by 2032, driven by health-conscious consumers seeking more from their products.Brands are using functional formulations to communicate claims such as digestive support, mood enhancement, and strengthened immunity.

It's crucial to ensure that claims are appropriate for the product category and based on strong scientific evidence.

Straightforward claims based on specific nutrient levels (e.g., "good source of vitamin E").Health Claims refer to a reduction in disease risk and are more strictly regulated.Structure-Function Claimsrefer to claims like aiding digestion but must be based on the nutritional value of the product. Non-nutritional claims can lead to regulatory issues.

Claims must be adequately substantiated and aligned with both FDA and FTC requirements.Brands must provide competent and reliable scientific evidence, typically through well-controlled human clinical studies.For FDA-approved health claims, prior authorization and specific evidentiary standards must be met.

It is important to ensure that novel ingredients are sufficiently studied to meet the competent and reliable scientific evidence standard.Brands should be aware of previous research conducted on a particular ingredient.If a brand receives regulatory or legal attention on a claim, it should be prepared to provide substantiation for their claims and demonstrate that the substantiation meets FDA and FTC expectations.

Brands can leverage services from firms like Registrar Corp, which helps companies navigate FDA requirements through labelling review, ingredient review, and ensuring compliance with food safety and FDA regulations.While nutrient content claims and health claims have clear guidelines, structure-function claims can be trickier, especially if based on non-nutritive ingredients.Dietary supplements can make structure-function claims based on either nutritive or non-nutritive ingredients, but conventional foods are limited to nutritive value.

Brands should consult with experts to ensure that the level of data supporting the claim is adequate. This can include consulting a medical or scientific advisory board.
The article emphasizes the importance of navigating the regulatory landscape carefully when marketing mood foods and functional ingredients. Brands must ensure that their claims are supported by strong scientific evidence and comply with FDA and FTC requirements to avoid regulatory issues.
https://www.foodnavigator-usa.com/Article/2024/11/13/ensuring-compliance-for-functional-claims/

India's nutra regulations: Inter-ministerial committee report receives mixed industry response

By Tingmin Koe 26-Nov-2024

The inter-ministerial committee in India has proposed new regulations for nutraceuticals, which has received mixed responses from the industry.

Key points from the 20-page report include:
Disease Risk Reduction (DRR) claims should be regulated by the Central Drugs Standard Control Organisation (CDSCO). Nutritional and health claims to be regulated by the Food Safety and Standards Authority of India (FSSAI). Current misuse of DRR claims by Food Business Operators (FBOs) without adequate scientific evidence. Separate Good Manufacturing Practices (GMP) requirements for health supplements and nutraceuticals.

Companies might need to change labels or reduce DRR claims on products.Smaller FBOs may struggle with clinical trial costs and requirements. Potential for increased complexity and duplication in regulatory processes for importers.Dr. Vaibhav Kulkarni supports clearer regulations to prevent false claims but notes operational challenges.Former FSSAI director Pradip Chakraborty highlights the burden on smaller FBOs and potential delays due to new clinical trial requirements. Recommendations need to be debated in parliament, and amendments to the FSS Act are required.The legislative process may take one to two years or longer.

The full implementation of these recommendations could significantly affect how nutraceuticals are marketed and regulated in India, aiming for better consumer protection and product credibility.
https://www.foodnavigator-asia.com/Article/2024/11/26/indias-inter-ministerial-committees-nutraceutical-regulatory-proposal-draws-mixed-responses/