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perspectives on food technologies & business

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13th ANNIVERSARY special

FROM RULES TO TRUST

20 Years of India's Food Safety Transformation





"Our objective is to create greater regulatory convergence while allowing States to respond to their specific local food environments"

- Rajit Punhani, Chief Executive Officer, Food Safety and Standards Authority of India

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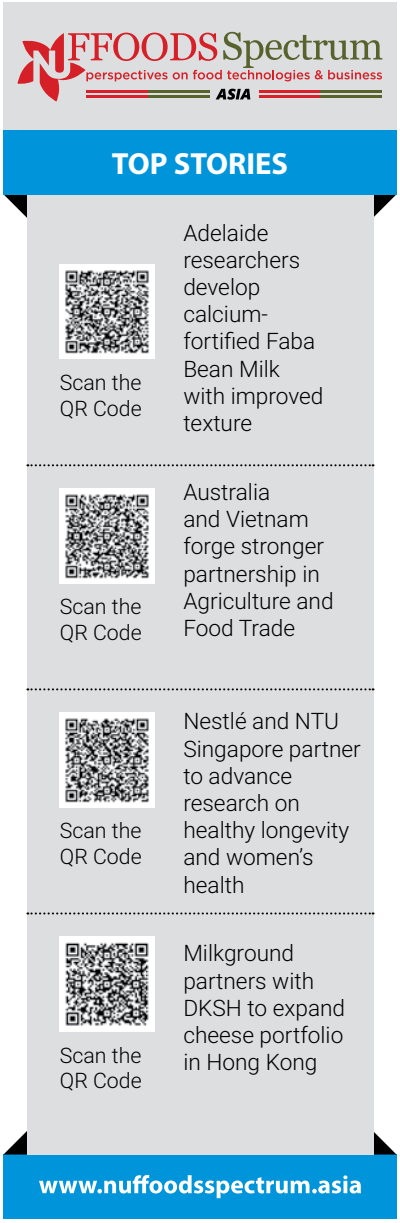
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Letter from Publisher



Ravindra Boratkar
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Managing Editor,
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Dear Readers,

Twenty years ago, India took a defining step towards building a modern food-safety ecosystem with the enactment of the Food Safety and Standards Act, 2006. What began as an effort to consolidate a fragmented regulatory landscape has, over two decades, evolved into a broader transformation—reshaping the relationship between the regulator, the food industry and the consumer.

As NUFFOODS Spectrum celebrates its 13th anniversary, this milestone offers an opportunity to look beyond the rulebook and examine how India's food ecosystem has evolved since the FSS Act came into being. The significance of the FSS Act lies not simply in the legislation itself, but in the regulatory architecture and culture that have developed around it. The establishment of the Food Safety and Standards Authority of India (FSSAI) brought together responsibilities for setting standards, undertaking scientific risk assessment, regulating food businesses and strengthening consumer protection under a national framework.

Over the years, the scope of food regulation has expanded considerably. India has moved from a predominantly adulteration-focused approach towards a more comprehensive system addressing contaminants, residues, microbiological safety, food additives, labelling, imports, organic foods, fortified foods, nutraceuticals, novel foods and other emerging categories. The regulatory system has had to evolve alongside an industry that has itself become more sophisticated, innovative and globally connected.

For the food industry, one of the most consequential changes has been the movement towards a more structured and increasingly digital compliance environment. Licensing and registration, once associated largely with paperwork and physical processes, have progressively moved online. Risk categorisation, surveillance, testing and data-driven enforcement are changing how compliance is understood and practised.

This evolution has also placed the consumer closer to the centre of food regulation. Food safety today is not only about preventing unsafe products from reaching the market; it is also about enabling consumers to make informed choices. Labelling, nutritional information, claims, allergens and transparency have therefore become increasingly important elements of the food-safety conversation. For this special anniversary edition, we have brought together 13 articles offering diverse perspectives on India's food and nutrition ecosystem. We also feature an interview with the Chief Executive Officer, Food Safety and Standards Authority of India, providing valuable insights into the regulator's priorities, the evolution of food-safety governance and the road ahead for India's food industry. The conversation offers an important perspective on how science, technology, regulatory convergence and industry collaboration can shape the next phase of India's food-safety journey.

The 20-year milestone is also an opportunity to recognise the contribution of policymakers, regulators, scientists, laboratories, industry associations and food businesses that have helped build this ecosystem. This transformation could not have happened through legislation alone; it has required sustained engagement between government, industry and science.

Yet, the next 20 years could be even more challenging. Alternative proteins, precision fermentation, novel ingredients, functional foods, personalised nutrition, biotechnology, artificial intelligence and increasingly complex global supply chains will create new questions for regulators and businesses. Climate change will add another layer, affecting food production, contamination risks and supply-chain resilience. The challenge ahead is to make regulation smarter, faster, more science-led and responsive to innovation, while keeping consumer safety firmly at its core.

I am sure you will find this anniversary edition a great read.

Thanks & Regards,



Ravindra Boratkar
Publisher & Managing Editor

CONTENT

COVER STORY 10

FSS ACT@20

FROM RULES TO TRUST

20 Years of India's Food Safety Transformation



13

"Our objective is to create greater regulatory convergence while allowing States to respond to their specific local food environments"

Rajit Punhani,
Chief Executive Officer, Food Safety and Standards Authority of India



17

The Science Behind Safer Food

Dr Komal Chauhan, Dean (Research & Outreach), Director, Centre for Food Research and Analysis (CFRA), Head, Centre of Excellence for Food Fortification (CEFF), National Institute of Food Technology Entrepreneurship and Management (NIFTEM), Kundli



15

From Rulebook to Public Trust

Pawan Agarwal,
Former CEO, FSSAI (2015 to 2020) and current CEO, Food Future Foundation



19

When Food Safety Became an Industry Imperative

Amitabh Baxi,
Director – External Affairs and Sustainability, McCain Foods India



21

From Evidence to Action

Dr P. Suresh Kumar,
Principal Scientist (Hort.), ICAR–National Research Centre for Banana, Tamil Nadu



23

How India's Food Regulation Evolved

Dr Vaibhav Kulkarni,
Honorary Secretary, Health Food & Dietary Supplements Association (HADSA); Founder and Director, ZANTUS Lifesciences



26

Making Safety Work Across the Food Chain

Munish Sharma,
Chief Operating Officer, Food Services, Compass Group India



29

When Science Took the Lead

Shilpa Aggarwal,
Vice President & Head of Operations, Ind Food and Beverage Association (IFBA)



31

The Digital Turn in Food Safety

Suresh Garg,
Founder and Managing Director, Zeon Lifesciences



33

What Comes After Compliance?

Sanjay Jain,
Director, Elanpro



35

Building Food Safety Through Shared Responsibility

Dr Shaheen Majeed
(D.Litt.), Global CEO & Managing Director, Sami-Sabinsa Group



37

The New Currency of Food Safety: Transparency

Dr Shilpa Vora,
Chief R&D Officer, Marico Limited



39

Securing Quality from Farm to Fork

Pradip Narayan Das,
Senior General Manager & Head - QA , Heritage Foods Limited



41

Writing the Next Chapter of Food Safety

Paritosh Ladhani,
Joint Managing Director, SLMG Beverages

42 The Borrowed Evidence Problem



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Thanks for your feedback. We have taken note of your suggestions and will surely try to incorporate the content accordingly in coming issues. Please keep sending us your feedback and updating us on your views about the issue and keep giving your opinions on the content.

– Editor

Please send your feedback to communications@nuffoodsspectrum.in



One Region, One Food Safety Language

Dr Milind Kokje
Chief Editor

Malaysia's decision to join the Asia Pacific Food Regulatory Authority Summit (APFRAS), following Cabinet approval, could mark an important step towards deeper food regulatory cooperation in the region. Malaysia aims to use its membership to transform food safety governance through digitalisation and position itself as a regional "Smart Gatekeeper".

The country plans to contribute to the digital transformation of food safety governance, develop regulatory approaches for biodegradable packaging materials and support greater harmonisation of legislation governing new food innovations. The move is also expected to strengthen Malaysia's national food safety and food security priorities.

The urgency is clear. Malaysia's food imports increased from RM42.6 billion in 2013 to RM78.9 billion in 2023, an increase of about 85 per cent. As food supply chains become increasingly international, ensuring food safety can no longer be addressed solely within national borders. Risks can move rapidly across countries, making regulatory cooperation essential.

Malaysia's entry is equally significant for APFRAS. Established in 2023 as a ministerial-level consultative platform, APFRAS seeks to strengthen food regulatory cooperation and promote science-based approaches to food safety across the Asia-Pacific. Its fourth summit, held in Jeju Island, South Korea, in May 2026, brought together food regulatory authorities from across the Pacific region, alongside international organisations.

The significance of APFRAS lies in its potential to move beyond information sharing towards institutional cooperation and regulatory convergence. South Korea's Minister of Food and Drug Safety, Oh Yu-Kyoung, underscored this direction by emphasising that food safety cannot be achieved by a single country or sector and requires the integration of intelligence, innovation and collective responsibility.

At the global level, the Codex Alimentarius provides the foundation for international food standards, guidelines and codes of practice. Regional cooperation can complement Codex by addressing the specific regulatory and commercial realities of neighbouring economies. This is particularly relevant in the Asia-Pacific, one of the world's most dynamic food-processing and trading regions. From India and Southeast Asia to China, Japan, Australia and New Zealand, food manufacturers increasingly operate across interconnected markets. Yet differences in requirements for ingredients, additives, contaminants, labelling, testing, certification and product approvals can turn one product into multiple compliance exercises.

For industry, regulatory fragmentation is no longer simply an administrative burden; it is a competitiveness issue. Regional convergence could reduce compliance costs, facilitate trade, improve regulatory predictability and strengthen responses to food-safety emergencies. However, harmonisation should not mean imposing an identical regulatory system on every country. Food cultures, consumption patterns, risk profiles and institutional capacities differ. The more practical goal is regulatory convergence — common scientific principles, definitions, reference standards, testing methodologies and conformity-assessment mechanisms, while allowing countries to retain legitimate national measures.

Three priorities should now move up the agenda. First, APAC regulators should align with Codex standards wherever scientifically appropriate and establish transparent procedures for national deviations. Second, countries should pursue mutual recognition of accredited laboratories, inspections and certifications, reducing duplication for businesses. Third, regulators should build interoperable digital systems for certificates, traceability and regulatory information.

These measures could particularly benefit small and medium-sized food businesses by lowering market-entry costs and opening more opportunities for regional trade.

The Asia-Pacific food economy is already deeply interconnected. APFRAS now has an opportunity to ensure that its regulatory architecture catches up — creating, over time, one region with a more consistent food-safety language. NS



FSS ACT@20

FROM RULES TO TRUST

20 Years of India's Food Safety Transformation

In August 2006, India took a decisive step towards changing the way it regulated food. The Food Safety and Standards Act, 2006 brought together a fragmented regulatory landscape under a single framework and laid the foundation for the Food Safety and Standards Authority of India (FSSAI). What followed was more than an administrative restructuring. Over two decades, India's food safety ecosystem has steadily moved from a largely reactive approach centred on adulteration and enforcement towards one built around science, prevention, quality assurance, traceability, technology and consumer trust.

As NUFFOODS Spectrum celebrates its 13th anniversary, this year's anniversary special marks another important milestone for India's food ecosystem: 20 years of the Food Safety and Standards Act. To commemorate the occasion, the special edition brings together 13 articles from experts across industry, academia and the policy ecosystem, offering perspectives on how India's food safety journey has evolved, the transformation underway today and the priorities that will shape its next chapter.

From multiple rulebooks to one framework

Before 2006, food regulation was spread across several laws, orders and authorities, creating a fragmented system for businesses and consumers. The FSS Act sought to consolidate this landscape and establish a more coherent, science-based framework.

Over the past two decades, this transformation has gradually moved food safety beyond the realm of government enforcement towards a broader ecosystem of responsibility. Regulators, businesses, scientists and consumers today all have a role in creating confidence in the food system.

That change has been accompanied by a fundamental evolution in regulatory thinking. Instead of asking only whether a food product violates a prescribed standard, the system increasingly considers how risks can be identified, prevented and managed across the food chain.

Science becomes the foundation

The growing role of science is one of the defining features of India's food safety journey.

The last two decades have seen food safety expand beyond laboratory testing towards integrated systems of quality assurance, traceability and preventive controls. The focus is increasingly on understanding risks before they reach the consumer rather than simply detecting problems after they occur.

The role of academic and scientific institutions has also become more important in shaping regulation itself. Research and evidence are increasingly being translated into standards and regulatory approaches. This connection between science and policymaking will remain critical as India deals with new food technologies, changing consumption patterns and emerging safety risks.

From compliance to prevention

The transformation is equally visible inside the food industry. Food safety has increasingly become embedded in manufacturing, sourcing, quality systems and organisational culture rather than being treated simply as a regulatory

20 YEARS
SAFER FOOD. HEALTHIER INDIA.

The FSS Act
2006 – 2026
From Fragmented Laws to a Science-Led Food Safety Ecosystem

Two decades of regulation, reform, technology and trust.

fssai
Food Safety and Standards Authority of India



Safe Food | Better Nutrition | Stronger India

THE BIG PICTURE

Before 2006

- Multiple food laws and orders (eg. Prevention of Food Adulteration Act, Milk & Milk Products Order, Meat Food Products Order, etc.)
- Product-specific and fragmented regulation
- Reactive enforcement

The FSS Act, 2006

- Consolidated multiple laws into a single framework
- Established the Food Safety and Standards Authority of India (FSSAI)
- Adopted a science-based, horizontal approach to food safety across the entire food chain.

HOW THE FSS ACT CHANGED INDIA'S FOOD SYSTEM

- From fragmented laws to a unified framework
- From reactive enforcement to risk-based regulation
- From adulteration control to end-to-end food safety
- From paper-based licensing to digital compliance
- From product-specific regulation to science-based standards
- From limited consumer information to greater transparency
- From traditional food categories to nutraceuticals, novel foods, fortified foods and emerging segments



KEY MILESTONES

2006 — FSS Act enacted
A unified legislative framework for food safety and standards.

2008 — FSSAI established
National regulator for food safety, standards, risk assessment and consumer protection.

2011 — Rules & regulations operational
Licensing, registration, standards, labelling, testing, imports and enforcement frameworks come into force.

2016 — Nutraceuticals & novel foods
Regulations for health supplements, functional foods, special dietary uses, medical foods and novel foods.

2017 — Imports, organic, recall & non-specified
Frameworks for food imports, organic foods, food recall and non-specified foods & ingredients.

2018 — Fortification
Standards for fortified foods and alcoholic beverages.

2020 — Labelling & display
Stronger consumer information on ingredients, nutrition, allergens, dates, claims and more.

2020+ — FoSCoS & digital compliance
Online licensing, registration and compliance; data-driven, risk-based enforcement.

2021+ — Risk-based inspection & surveillance
Targeted inspections, surveillance sampling, stronger laboratory network, food recalls.

2022–26 — A broader ecosystem
Safety + nutrition + innovation + consumer protection + digital governance.

MAJOR AMENDMENTS & REGULATORY EXPANSION

Notable regulatory milestones (under the FSS Act)

2016 — Nutraceuticals, health supplements, functional & novel foods

2017 — Organic foods, food imports, recalls, non-specified foods

2018 — Food fortification (+ alcoholic beverages)

2020 — Labelling & display regulations

2020s — FoSCoS, digital compliance, risk-based enforcement

Hundreds of amendments to FSSAI regulations (since 2011)

Important: The FSS Act (parent legislation) was enacted in 2006. The detailed evolution has largely happened through rules, regulations, amendments, standards, directions and digital systems — not through frequent changes to the Act itself.

FROM INSPECTION TO PREVENTION

- Training & capacity building (FoSTaC)
- Food safety management systems
- Laboratory & testing infrastructure
- Risk-based surveillance & enforcement

Food safety is not just an inspection function.
It is a culture across the food industry.

THE IMPACT: WHAT HAS THE ACT ACHIEVED?

Safer Food
Reduced adulteration, contamination and foodborne risks.

Stronger Consumer Protection
More information, transparency and choice.

Thriving Food Economy
Support for innovation, exports and global competitiveness.

Better Nutrition
Fortification and health-focused regulation.

Robust Ecosystem
Government, industry, scientists, labs, academia and consumers working together.

THE ROAD AHEAD: THE NEXT 20 YEARS



Emerging priorities

- Next-gen foods (alternative proteins, precision fermentation, novel ingredients)
- Climate resilience (food safety & security)
- Faster science & stronger labs
- Better data & digital intelligence
- Global supply chains & trade

The challenge

To protect consumers without becoming a barrier to responsible innovation.

The next 20 years will determine whether India's food-safety ecosystem can keep pace with the speed at which food itself is changing.

FSS Act 2006 – 2026 SAFE FOOD | HEALTHIER PEOPLE | A STRONGER TOMORROW

obligation. For India's increasingly science-driven food and nutraceutical sectors, safety, quality and scientific evidence are becoming central to business credibility. Companies seeking to compete in domestic and global markets will increasingly need to demonstrate—not merely claim—the quality and safety of their products.

Transparency and changing consumer expectations are also reshaping the equation. Trust today is no longer created simply by regulatory compliance. Consumers increasingly want to know what is in their food, where it comes from and whether the claims made about it can be substantiated.

The food chain becomes the unit of safety

Food safety cannot stop at the factory gate. It extends across sourcing, processing, storage, transportation, retail and food service.

As India's food supply chains become more complex, consistent quality controls and stronger systems of assurance are essential to ensuring that safety is maintained from source to consumer. Food safety is also becoming closely linked with the broader resilience of India's food economy. Stronger safety systems can support not only public health but also business continuity, consumer confidence and the growth of organised food services. This represents an important change in perspective. Food safety is no longer simply a cost of compliance. It is increasingly recognised as an investment in resilience, reputation and long-term growth.

Technology changes the regulatory frontier

The next phase of food safety is unlikely to be driven by regulation alone. Digital technology is already changing how compliance is monitored, documented and managed.

Digitisation can help businesses maintain records, monitor processes and respond more quickly to potential risks. The question now is how far India can move from compliance that is documented to compliance that is continuously visible, verifiable and data-driven.

The next generation of food safety regulation will increasingly bring together technology, stronger standards and more sophisticated monitoring systems, allowing businesses to demonstrate compliance in ways that are faster, more transparent and more measurable.

Industry participation becomes indispensable

The evolution of food safety has also changed the relationship between regulators and industry.

India's regulatory framework has evolved alongside new food categories, scientific developments and changing consumer expectations. The continuing challenge will be to ensure that regulation remains rigorous enough to protect consumers while being practical enough to support responsible innovation.

Science-led regulation and stronger collaboration between stakeholders will be essential. For a food sector as diverse as India's, effective implementation will require regulators, industry, laboratories and scientific institutions to work together rather than operate in silos.

The journey is far from over

Two decades after the FSS Act, India's food safety story is therefore no longer simply about creating rules. It is about building systems that consumers, businesses and global markets can trust. India has built the institutional architecture. It has strengthened scientific capacity, expanded quality assurance, embraced digital systems and placed greater emphasis on prevention and traceability. But the next chapter will demand even more: stronger surveillance, faster adoption of technology, greater supply-chain transparency, better consumer awareness and closer collaboration between government, academia and industry.

The Food Safety and Standards Act began as a legislative intervention. Twenty years later, its larger legacy is the creation of an ecosystem.

The first two decades were about building the framework. The next phase will be about making that framework smarter, more preventive, more transparent and more trusted.

Because ultimately, food safety is not only about whether food meets a standard. It is about whether consumers can trust what is on their plate—and whether the system behind it can prove that trust is deserved. NS

"Our objective is to create greater regulatory convergence while allowing States to respond to their specific local food environments"



Rajit Punhani,
Chief Executive Officer, Food Safety and Standards Authority of India

The Food Safety and Standards Authority of India (FSSAI) is the apex food regulatory authority in India, established under the Food Safety and Standards (FSS) Act, 2006 and functioning under the Ministry of Health and Family Welfare, Government of India. Since 2006, FSS Act has enabled to establish FSSAI for laying down science-based standards for articles of food and to regulate their manufacture, storage, distribution, sale and import, to ensure availability of safe and wholesome food for human consumption and for matters connected therewith or incidental thereto. As the FSS Act completes 20 years, NUFFOODS Spectrum took this opportunity to interact with Rajit Punhani, Chief Executive Officer (CEO), FSSAI, to find out how the regulatory system is keeping pace with food innovations across the country. Edited excerpts

Looking back at the last two decades, what do you see as FSSAI's most significant achievements in transforming India's food safety ecosystem, and where do you believe the biggest gaps still remain?

The creation of FSSAI under the Food Safety and Standards Act, 2006 was a landmark step in bringing India's food regulatory framework under a single, science-based architecture. Over the past two decades, one of our most significant achievements has been to move from a largely fragmented regulatory landscape towards an integrated food safety ecosystem covering standards, licensing, surveillance, testing, enforcement, capacity building and consumer awareness.

We have also made significant progress in using technology to make food safety regulation more transparent and accessible. Digital platforms such as FoSCoS have transformed the way food businesses interact with the regulatory system, while initiatives such as the Food Safety Connect app, food testing laboratories, risk-based inspections and digital surveillance have strengthened our ability to identify and respond to food safety risks. At the same time, programmes under the Eat Right India movement have expanded the conversation beyond food safety to include healthy diets, nutrition and informed consumer choices.

However, food safety is a continuous journey. We will continue to strengthen testing and surveillance capacity, improving last-mile enforcement, building the skills of food safety personnel and ensuring greater compliance among smaller and informal food businesses.

FSSAI has increasingly moved towards risk-based enforcement, with greater attention to high-risk food categories and stronger coordination with States and Union Territories. How is FSSAI working to make enforcement more consistent across the country, particularly given the wide variation in regulatory capacity at the state and local levels?

Food safety is a shared responsibility between FSSAI, the States and Union Territories, local authorities, food businesses and consumers. Given the scale and diversity of India, consistency cannot mean applying an identical enforcement approach everywhere; it means ensuring that the same science-based principles, standards and regulatory expectations are applied across the country.

FSSAI is therefore progressively shifting the focus from volume-based enforcement to risk-based and intelligence-led enforcement. This means directing inspections, sampling and testing towards food categories, businesses and activities where the potential risk to consumers is greater. The recent regulatory reforms have also strengthened the emphasis on risk-based inspection and food safety audits.

At the same time, we are working to strengthen the capacity of States and local authorities through MoUs,

training, guidance documents, technology-enabled systems and greater sharing of data and best practices. Digital platforms provide an important common backbone for licensing, compliance and regulatory oversight.

Our objective is to create greater regulatory convergence while allowing States to respond to their specific local food environments. Ultimately, effective enforcement is not measured simply by the number of inspections or samples collected; it is measured by whether risks are identified early and corrective action is taken effectively.

The regulatory framework is also undergoing significant reforms, including perpetual validity of licences and registrations and measures intended to reduce compliance burdens. How does FSSAI balance ease of doing business with the need for stronger surveillance, inspections and accountability of food businesses?

Ease of doing business and food safety are not competing objectives. In fact, a well-designed regulatory system should make it easier for compliant businesses to operate while making it more difficult for unsafe or non-compliant practices to go undetected.

The recent reforms reflect this approach. Perpetual validity of FSSAI licences and registrations removes the need for periodic renewals, thereby reducing paperwork and repetitive compliance requirements. In addition, perpetual validity does not mean perpetual exemption from scrutiny. Licences and registrations can still be suspended, cancelled or surrendered, and food businesses remain responsible for maintaining food safety, hygiene and other statutory requirements. The reforms have also introduced risk-based inspection and food safety audit frameworks.

This represents an important regulatory shift from routine procedural compliance towards continuous compliance and risk-based oversight.

Misleading nutritional, health and "natural" claims, along with labelling and packaging compliance, have emerged as major areas of consumer concern. What changes does FSSAI believe are necessary to ensure that food labels and marketing claims become more transparent, scientifically substantiated and meaningful to consumers?

A food label is one of the most important points of communication between a food business and consumers. FSSAI's regulatory framework seeks to ensure that information relating to the composition, nutritional characteristics and other attributes of food is presented in a manner that is clear, accurate and not misleading.

The Food Safety and Standards (Labelling and Display) Regulations, 2020 prescribe requirements for the information to be provided on food labels, while the Food Safety and Standards (Advertising and Claims) Regulations, 2018 lay down requirements for claims and advertisements relating to food. These regulations are intended to ensure that claims made by food businesses are truthful, scientifically substantiated and do not mislead consumers. The framework is also reviewed and strengthened periodically to address emerging products, marketing practices and consumer concerns. The objective is to ensure that food labels and claims provide reliable and meaningful information, enabling consumers to make informed choices.

India's food system is changing rapidly, with the emergence of novel foods, alternative proteins, functional foods, new ingredients and increasingly technology-driven food production. How is FSSAI preparing its scientific and regulatory framework to assess these innovations without either compromising safety or slowing responsible innovation?

Innovation in the food sector is advancing rapidly, from novel ingredients and alternative proteins to precision fermentation, functional foods and new processing technologies. Regulation must keep pace with this evolution, but it must do so without compromising the fundamental principle that safety cannot be negotiated.

FSSAI already has a regulatory framework covering health supplements, nutraceuticals, functional foods and novel foods, supported by a scientific assessment process. The regulatory approach for emerging products is based on scientific evaluation of factors such as the nature of the ingredient or product, its history of consumption, the process through which it is produced and potential risks to human health. Our approach is therefore neither to resist innovation nor to regulate it indiscriminately.

What would you like India's food safety system to look like by 2030, and what are the three priorities that, in your view, will be most critical for FSSAI to achieve that vision?

I would like India to have a food safety system that is increasingly preventive, predictive, technology-enabled and trusted; a system in which food safety is built into the entire food value chain rather than addressed only after a problem occurs.

Our vision is not simply to have stronger enforcement, but to create a food ecosystem where safe food is the norm, compliance is embedded in business culture, consumers are informed, and regulation keeps pace with science and innovation. That is the food safety system India should aspire to by 2030. NS

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From Rulebook to Public Trust



Pawan Agarwal,
Former CEO, FSSAI (2015 to 2020) and current CEO, Food Future Foundation

India's food-safety story over the past two decades is not just about new rules—it is about building an entirely new regulatory ecosystem. From a fragmented, largely reactive system focused on adulteration, the country has moved towards prevention, science-based standards, digital oversight and shared responsibility across the food chain. At the heart of this transformation has been FSSAI, which has spent two decades building the institutional machinery behind safer food. The next challenge is no longer simply writing or enforcing rules, but turning them into everyday compliance, healthier choices and lasting consumer trust.



The Food Safety and Standards Act, 2006 marked a turning point in India's approach to food safety. Until then, regulation was spread across several laws, ministries and commodity-specific orders. The system focused mainly on detecting adulteration and acting after a violation had occurred.

The Act brought these laws under one framework and created the Food Safety and Standards Authority of India (FSSAI). India began moving from reacting to adulteration towards preventing risks across the food chain, from factories and farms to shops, restaurants and homes. The law introduced common national standards, science-based decision-making, and a unified system of licensing and registration. It also recognised that food safety was a shared responsibility involving governments, businesses and consumers.

However, passing a law and building an effective regulator are very different tasks. During the first five years, much of the effort went into establishing FSSAI, framing basic rules, setting up offices and defining responsibilities between the Union and state governments.

Building a Full-Fledged National Regulator

When I joined FSSAI in 2015–16, only about 10–15 per cent of the regulatory framework envisaged under the law was in place. The institution still needed a much wider set of standards, people and systems to function as a full-fledged regulator.

Over the next five years, regulations were developed for food categories, labelling, packaging, additives, contaminants, pesticide residues, imports and advertising claims. Staff were recruited, offices strengthened and regulatory systems established. By the time I left in 2020, nearly 90 per cent of the required framework had been put in place.

This history explains many regulatory actions being reported today. They are often presented as new requirements, but many are the implementation of standards framed and notified years ago.

A regulation must go through scientific review, public consultation, notification and a transition period. Authorities then need the capacity to test and enforce it. This process can take several years, while the COVID-19 pandemic caused further disruption.

Standards concerning pesticide residues, tea and food served in schools have long been part of the framework. Companies may feel the pinch because compliance is now being monitored more rigorously, but the requirements are neither sudden nor unexpected.

From Registration to Everyday Compliance

A major change during this period was the move

from paper-based processes to digital regulation. India has millions of food businesses, ranging from large manufacturers to small shops and street vendors. Such a vast sector cannot be regulated through paper records and occasional inspections alone.

Digital platforms were introduced for licensing, registration, inspections, import clearances and surveillance. They made it easier for businesses to interact with regulators while improving transparency and access to information.

The aim was to move from registration to real compliance. A licence is only the beginning; safety depends on how businesses handle ingredients, maintain hygiene, train workers and store food every day.

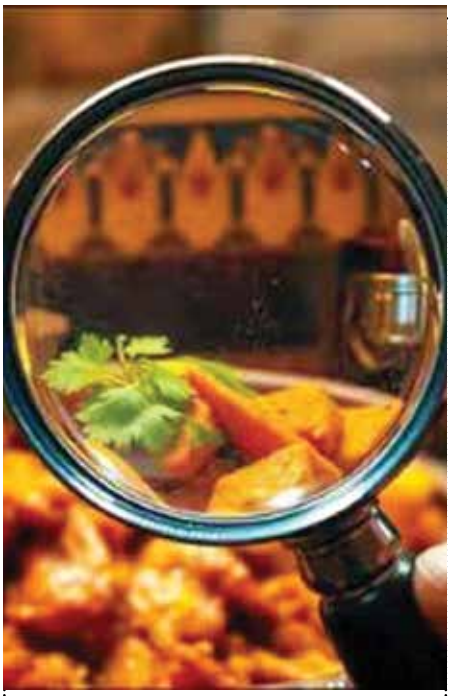
FSSAI therefore promoted self-compliance, especially among smaller businesses. A nationwide food-safety training and certification system created a large pool of trained food-safety supervisors who could help enterprises adopt safe practices.

Food safety was also taken beyond factories to restaurants, street-food vendors, schools, railway stations, campuses and places of worship. Hygiene ratings and safer street-food hubs helped make safety visible in everyday life.

Testing capacity improved as well. National laboratories were modernised, state facilities strengthened and recognised private laboratories brought into the network. Better testing and surveillance now allow authorities to detect violations more effectively.

From Safe Food to Healthy Diets

As FSSAI developed, its role expanded beyond preventing contamination and adulteration. With India facing rising obesity, diabetes, hypertension and other diet-related diseases, regulation also had to support better nutrition.



The Eat Right India movement connected food safety with nutrition, public health and sustainability. Food fortification sought to address micronutrient deficiencies, while other initiatives focused on removing industrially produced trans fats and reducing excessive salt, sugar and fat.

FSSAI also became a more public-facing institution. Campaigns in schools, workplaces and public spaces encouraged consumers to read labels and make informed choices.

Closer scrutiny of labels and advertising claims is part of this responsibility. The law has long prohibited misleading claims. If regulators question terms such as "energy" or "100% pure," it is because they may create impressions that cannot be substantiated.

"Energy" requires particular care when products are promoted to children and young adults, as it may suggest benefits beyond their actual nutritional value. Brands naturally seek to stand out, but strong marketing claims must be supported by strong evidence. Greater scrutiny often reflects closer enforcement of existing provisions, not a sudden change in the law.

The Next Twenty Years: From Compliance to Trust

India has made substantial progress, but implementation remains uneven. Enforcement capacity differs across states, while gaps persist in staffing, laboratories, surveillance and municipal capacity. Smaller businesses can also find compliance difficult or costly.

Meanwhile, online delivery, cloud kitchens, nutraceuticals and novel foods are creating new challenges. Regulators must also address antimicrobial resistance, emerging contaminants, food fraud and climate-related threats while governing both organised industry and India's vast informal food economy.

The next phase requires an integrated national food-safety intelligence system, supported by real-time surveillance, traceability and better use of data. State and municipal institutions must be strengthened because national standards ultimately depend on local implementation. Compliance should be simpler for responsible small businesses, alongside firm action against deliberate violations.

Over two decades, FSSAI has evolved from a new rule-making body into the central institution of India's food-safety system. Its success should now be measured not only by regulations, licences or inspections, but by better public-health outcomes and greater consumer confidence. The task for the next twenty years is to make safe and healthy food not merely a promise in law, but an everyday reality for every Indian. NS

The Science Behind Safer Food



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India's food safety journey has evolved from reactive testing to prevention, scientific risk assessment and digital traceability. The article examines how this transformation has strengthened quality assurance—and why bridging the gap with the unorganised food sector is now the next big challenge.

India's food safety ecosystem has changed over the last 20 years from a disjointed, reactive anti-adulteration strategy to an integrated, science-based framework for quality assurance. The Food Safety and Standards Act, 2006 has modernised laboratory networks, digitised regulatory compliance and pioneered supply chain traceability. Although export channels have benefited from these developments, bridging the structural dualism in the unorganised domestic market will be the top priority over the next ten years. Reactive policing and legislative fragmentation characterised India's food regulatory environment for decades following independence. The country's early legislative focus was primarily on the availability of staples rather than advanced quality and safety management. The Prevention of Food Adulteration Act, 1954 operated alongside commodity-specific orders administered by different ministries, resulting in enforcement gaps and overlapping jurisdictions.

A significant change occurred with the passage of the Food Safety and Standards Act, 2006, which unified disparate laws into a scientific framework administered by the Food Safety and Standards Authority of India (FSSAI). The landmark law moved the food ecosystem toward self-compliance and proactive risk analysis, redefining domestic public health and economic competitiveness in an era of globalised supply chains.

Scientific Testing, Analytical Methods, and Risk Assessment

Under the Prevention of Food Adulteration Act regime, enforcement depended largely on end-product testing. Inspectors collected finished goods from retail shelves to verify compliance with prescribed limits. However, this approach was limited in identifying or preventing contamination introduced earlier in the supply chain.

The Food Safety and Standards Act, 2006 formally mandated a shift toward risk analysis under Section 18, dividing governance into risk assessment, risk management and risk communication. Modern standard setting employs Quantitative Microbial Risk Assessment (QMRA) and Predictive Microbiology to model pathogen behaviour rather than simply reacting to finished-product failures. This helps regulators and manufacturers identify Critical Control Points (CCPs) and apply scientific processing parameters.

Laboratory Strengthening and Method Standardisation

A risk-based food safety framework depends on robust laboratory infrastructure. Over the past two decades, India has strengthened its multi-tiered network of National Reference Laboratories (NRLs), state public laboratories and state-notified private testing facilities. FSSAI has standardised sampling protocols and analytical method validation to ensure that testing data are scientifically valid and legally admissible. Alignment of domestic laboratory protocols with Codex Alimentarius guidelines has also supported international trade by reducing export rejections. Specialised analytical testing further helps confirm food authenticity and origin.

From Policing to Prevention

FSSAI's regulations follow a tiered, risk-based approach to translate regulatory standards into practical processing controls. Small food businesses are required to register and comply with basic Good Hygiene Practices (GHP) and Good Manufacturing Practices (GMP). Larger food business operators (FBOs) are required to implement Food Safety Management Systems (FSMS), including Hazard Analysis and Critical Control Point (HACCP), and obtain formal operating licenses.

Despite implementation challenges, evidence shows that small-scale processors can adopt international food safety standards. A case study of a small-scale snack manufacturing unit in Kerala found significant non-compliance before certification, particularly the absence of a documented HACCP plan. Following focused training and professional support, the facility achieved 97.14 per cent compliance in post-certification audits. This demonstrates that preventive quality systems can also be implemented in small-scale operations through structured support.

Traceability Frameworks and the Operational Realities of Food Recalls

The complexity of contemporary supply chains demands efficient traceability systems to manage food safety emergencies. Traceability, which enables food to be followed through production, processing and distribution, is an important risk management tool. Effective systems allow regulators and FBOs to conduct targeted recalls quickly, reducing public health impact and protecting brand integrity. Four basic pillars—product identification, data capture, link management and data communication—are fundamental to effective traceability and consumer confidence.

Export-oriented supply chains have pioneered such systems in India. APEDA's web-based traceability portals, including Grapenet and Tracenet, use GS1 standards to assign unique GTINs and GLNs across value chains, enabling international buyers to trace products back to the farm of origin. The domestic market, however, presents a different picture. Although barcodes are present on 96.8 per cent of packaged foods, they are primarily used for inventory and retail checkout rather than tracing ingredients back to their agricultural sources.

Structural Dualism and Fragmentation: Gaps in the Domestic Supply Chain

Despite technological progress, institutional, cultural and structural barriers continue to prevent a consistent food safety culture. The biggest challenge is the dualism within India's food industry. Multinational and export-oriented businesses have advanced quality assurance systems, while the domestic market remains highly unorganised and fragmented, involving millions of smallholder farmers, street food vendors and family-owned kirana stores.

Regulating this sector is difficult. Unsafe loose milk and street-vended foods remain public health vulnerabilities, while inadequate cold-chain infrastructure, shortages of Food Safety Officers (FSOs), lack of clean water and limited foodborne disease surveillance create additional challenges. Small-scale processors and marginal farmers may also face financial barriers to adopting digital traceability systems. Bridging this gap between technologically advanced formal supply chains and the largely unorganised domestic sector remains a major priority.

Strategic Directions for the Next Decade

As India enters the third decade of modern food safety governance, a multi-dimensional strategy is required to address these systemic challenges:

- **Decentralised Laboratory Expansion:** Regional state public laboratories should be upgraded with rapid detection technologies such as PCR and microfluidic Lab-on-a-Chip platforms to reduce turnaround times.
- **Inclusive, Low-Cost Digital Traceability:** Simplified, mobile-first barcode recording tools in local languages could enable smallholder cooperatives to enter digital supply chains without large capital investments.
- **Proactive Risk-Based Surveillance:** Inspections should increasingly follow risk-based classification, with limited resources targeted at high-risk sectors such as dairy, meat and street food. Standardised check-sheets and automated risk profiling can support this approach.
- **Advancing a National Food Safety Culture:** India must invest in consumer literacy, including education on nutritional labels and reporting of safety violations. Corporate-to-SME peer mentoring can also help build a wider quality culture.

Conclusion

In the last two decades, India has built a science-based regulatory framework that goes well beyond the reactive laws of the mid-twentieth century. The shift to preventive quality assurance, accredited laboratory testing and digital traceability has strengthened India's position in the global food market.

The next phase must focus on democratising these technologies and addressing the structural gap between formal and unorganised food sectors. Turning food safety from a regulatory burden into a shared national culture of public health protection will be essential to ensure that this safety net reaches every citizen. NS

(With imputs from Sweta Malakar, Quality Assurance Manager, CEFF, NIFTEM, Kundli)

When Food Safety Became an Industry Imperative



Amitabh Baxi,
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Two decades ago, India's food safety system was fragmented and largely invisible to consumers. Today, FSSAI has turned it into a more unified, science-led and digital ecosystem. The next 20 years will be about making food safety smarter, more transparent and trusted from farm to fork. For industry, that means moving beyond compliance to making safety a core part of how food is produced, processed and brought to market.



Almost two decades ago, as an Editor working on the consumer beat, I remember writing about how little most Indian households knew about what went into their food, not out of neglect, but because there was simply no single, credible source telling them. Food law in India back then was a patchwork: the Prevention of Food Adulteration Act here, the Fruit Products Order there, a Meat Food Products Order somewhere else, each administered by a different ministry, each speaking a slightly different regulatory language. A manufacturer selling across three states could, in theory, be answering to three different sets of rules.

The Food Safety and Standards Act, 2006 changed that in one stroke. It didn't just introduce a new law, it retired half a dozen old ones and, in their place, gave India a single regulator with a single mandate: science-based standards, applied consistently, from farm to fork. That regulator, the Food Safety and Standards Authority of India (FSSAI), became operational a couple of years later and has spent the better part of two decades building the architecture-licensing, laboratories, enforcement, awareness-that we now take almost for granted.

Twenty years is long enough to forget how far the ground has shifted. So, it's worth pausing, on this anniversary, to reflect on, not just of what FSSAI has built, but of what industry now owes it in return.

From fragmentation to a single source of truth

The early years of FSSAI were, understandably, about consolidation, bringing licensing under one roof, defining what "safe" actually meant in measurable terms, and building the administrative machinery to enforce it nationally. That groundwork was unglamorous but essential. You cannot regulate what you haven't first defined.

What followed was a steady widening of ambition. Licensing moved from a manual, state-by-state exercise to FoSCoS, the Food Safety Compliance System, a digital backbone that today lets a food business apply, renew, and track its status without walking into a government office. This year's amendments have gone further still, replacing periodic license renewal with perpetual validity for most categories, and shifting inspections toward a computer-assisted, risk-based model rather than blanket scrutiny. Street vendors, long outside the formal net, now get deemed registration if they're already registered under the Street Vendors Act. These aren't cosmetic changes. They represent a regulator that has matured from enforcement-by-paperwork to enforcement-by-data.

At the same time, FSSAI has grown teeth where it

needed to. This past year alone has seen some of the most assertive scrutiny yet of labelling claims and marketing language, purity claims, "natural" and "100%" assertions, flavouring disclosures, all being tested against what the science and the label actually say. For an industry that has occasionally treated packaging as marketing first and disclosure second, that's a necessary correction. Trust, once lost on a label, is expensive to rebuild.

The unglamorous backbone: science and testing

Arguably, none of this works without testing infrastructure, and this is the part of the story that rarely makes headlines. Risk assessment, reference laboratories, accreditation of testing facilities, these are the plumbing of food safety. A regulation is only as credible as the lab that can verify compliance with it. India's testing network has expanded meaningfully over 20 years, but it remains a work in progress, particularly in reach and turnaround time outside major cities. If there's one area where continued public investment will pay outsized dividends, it's here.

Where industry comes in

I'll admit a bias: I now sit inside the industry I used to write about, and that vantage point has only sharpened my sense of what good regulation actually asks of a manufacturer. It isn't just compliance, it's culture. At McCain India, our Mehsana (Gujarat) facility runs to FSSAI standards and GFSI-recognised certification simultaneously, because the two aren't in tension; global benchmarks and national law increasingly point in the same direction. That convergence is itself a sign of how far India's framework has come, it no longer sits apart from global best practice, it sits alongside it.



But quality doesn't start at the factory gate. It starts in the field, with the farmer growing the potato. Over the past few years, we've worked to bring regenerative agricultural practices, water-efficiency measures and Global GAP-aligned protocols into our grower network, not as a sustainability side-project, but because the safety and consistency of raw material upstream is inseparable from the safety of the product downstream. Food safety, done properly, is a supply chain discipline, not a finished-goods checkpoint.



What comes next

If the last 20 years were about building the architecture, the next phase is about using it well. A few priorities stand out.

Traceability needs to become the default expectation, not a premium feature, for both domestic consumers and export markets that increasingly demand farm-to-fork visibility. Sustainability and food safety are converging faster than regulation has caught up with; soil health, water stewardship and emissions reduction are quietly becoming food-safety questions, not just environmental ones. Novel foods, plant-based proteins, alternative ingredients and new processing techniques will test whether India's approval pathways can move at the pace of innovation without compromising rigour. And consumer awareness remains the most underused lever of all – a regulator can set the standard, and industry can meet it, but an informed consumer is what makes the whole system self-reinforcing.

None of this is industry's job alone, or FSSAI's alone. The last two decades proved that regulation works best as a partnership rather than a policing exercise, one where the regulator sets an ambitious, science-led bar, and industry treats meeting it as a baseline for competing, not a burden for complying.

I started my career writing about the gap between what regulation promised and what consumers actually experienced. Twenty years later, that gap has narrowed considerably, not closed, but narrowed in ways that would have seemed ambitious in 2006. The task now is to keep closing it, one harvest, one factory, one label at a time. NS

From Evidence to Action



Dr P. Suresh Kumar,
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Food is more than nourishment; it is fundamental to public health, economic growth, and national well-being. Changing lifestyles, urbanisation, globalisation of food trade, climate change, and advances in food science have transformed how food is produced, processed, transported, and consumed. These developments have enabled functional foods, fortified products, plant-based alternatives, and novel food ingredients, while also creating new safety challenges such as foodborne pathogens, chemical contaminants, antimicrobial resistance, food fraud, and risks associated with new technologies. Scientific research therefore plays a critical role in identifying hazards, evaluating risks, and ensuring that food safety regulations evolve with scientific advancements.

In India, the Food Safety and Standards Act, 2006 marked a significant milestone in modernising the country's food safety framework. Earlier, multiple laws governed different aspects of food quality and safety, resulting in fragmented regulation. The Act integrated these laws under a single framework and established the Food Safety and Standards Authority of India (FSSAI) as the country's apex food regulator. It shifted India's approach towards prevention, risk assessment, and continuous monitoring.

Regulations do not emerge in isolation. Behind permissible limits for pesticide residues, microbiological standards, and food additives lies scientific investigation. Researchers identify hazards, evaluate health risks, generate evidence, and develop analytical methods that enable regulators to establish standards. This evidence undergoes validation, peer review, and risk assessment before informing policy, while regulators also consider consumer exposure, technological feasibility, trade implications, and economic impact. Today, collaboration among research institutions, public health laboratories, and regulatory agencies is essential to address emerging challenges such as microplastics, antimicrobial resistance, climate-related food safety risks, and novel foods.

Why Academic Research Matters in Food Safety

Scientific research provides the foundation for modern food safety systems. It helps determine whether a contaminant, food innovation, or process is harmful, what level of exposure poses a health risk, which pathogens are emerging, and how contamination can be detected.

India has a strong scientific ecosystem comprising institutions under Indian Council of Medical Research (ICMR), Indian Council of Agricultural Research (ICAR), Council of Scientific & Industrial Research (CSIR), universities, and food technology institutes. These organisations generate knowledge on food microbiology, toxicology, nutrition, processing, and analytical sciences that contribute to national standards, surveillance programmes, and regulatory decision-making.

Researchers investigate biological hazards such as Salmonella, Listeria monocytogenes, and pathogenic Escherichia coli, as well as chemical contaminants including pesticide residues, heavy metals, mycotoxins, and veterinary drug residues. Research also helps identify emerging risks such as microplastics and antimicrobial resistance. Modern analytical techniques, including liquid chromatography coupled with mass spectrometry (LC-MS/MS), gas chromatography-mass spectrometry (GC-MS), whole genome sequencing, biosensors, and molecular diagnostics, have improved the sensitivity and speed of food safety testing. Researchers also generate exposure data by monitoring contamination levels and dietary patterns. Such information helps establish maximum residue limits, contaminant thresholds, and acceptable daily intake values based on real-world consumption. Academic institutions further contribute by evaluating emerging technologies such as high-pressure processing, cold plasma, active packaging, precision fermentation,

cultivated meat, and novel plant-based proteins. Researchers assess their safety, nutritional quality, allergenicity, and toxicological implications.

Ultimately, academic research transforms uncertainty into evidence, helping ensure that food safety policies remain responsive to evolving scientific knowledge.

Scientific Risk Assessment: The Bridge Between Research and Regulation

Modern food safety regulation is increasingly guided by risk analysis. Rather than attempting to eliminate every possible hazard, regulators identify, evaluate, and manage risks using the best available scientific evidence. Risk assessment connects academic research with policy decisions through four steps: hazard identification, hazard characterisation, exposure assessment, and risk characterisation.

Hazard identification determines whether a biological, chemical, or physical agent has the potential to cause adverse health effects. Scientific studies help identify pathogens, aflatoxins, heavy metals, pesticide residues, food allergens, and naturally occurring toxins.

Hazard characterisation evaluates the nature and severity of adverse health effects. Toxicological and epidemiological studies provide evidence on dose-response relationships and help estimate safe exposure levels. Risk assessments generate health-based guidance values such as the Acceptable Daily Intake (ADI), Acute Reference Dose (ARfD), and Tolerable Weekly Intake (TWI), which provide the scientific basis for regulatory decisions.

Exposure assessment estimates how much of a hazard consumers are likely to ingest through their normal diet. Researchers analyse contamination levels and consumption patterns because the presence of a contaminant alone does not necessarily indicate a health risk; its level and frequency of exposure are critical.

Finally, risk characterisation combines hazard and exposure information to estimate the likelihood and severity of adverse health outcomes and determine whether additional interventions are necessary. Risk assessment differs from risk management. While risk assessment generates scientific evidence, risk management selects appropriate regulatory measures after considering scientific, economic, technological, and societal factors. Risk communication enables transparent exchange of information among scientists, regulators, industry, healthcare professionals, and consumers.

Food Surveillance: Science Beyond the Laboratory

Scientific evidence must be continuously validated under real-world conditions. Food surveillance extends laboratory science into farms, processing units, markets, and retail outlets by monitoring biological, chemical, and physical hazards throughout the food supply chain. Routine surveillance analyses food samples for pesticide residues, heavy metals, mycotoxins, microbial contamination, food additives, and adulterants. These data help regulators assess compliance, identify emerging risks, and revise standards. During foodborne disease outbreaks, molecular techniques such as polymerase chain reaction (PCR) and whole genome sequencing (WGS) enable rapid pathogen identification and tracing of contaminated food sources. Digital technologies are also transforming food surveillance. Portable biosensors, artificial intelligence, blockchain, Internet of Things (IoT), and digital traceability systems can improve contamination detection, supply chain transparency, and product recalls. Consumer complaint portals and mobile applications further strengthen early warning systems.

Together, surveillance and research create a continuous feedback loop in which monitoring identifies emerging hazards, guides research, and supports evidence-based regulatory decisions.

Future thrust

India has steadily strengthened its capacity for science-based risk assessment over the past two decades. Collaboration among research institutions, laboratories, regulatory scientists, and public health experts has enhanced the country's ability to evaluate emerging food safety risks. Alignment with internationally accepted principles and the Codex Alimentarius Commission further supports harmonisation with global food safety standards while addressing national priorities.

As food systems evolve, scientific risk assessment will remain central to regulatory decision-making. Climate change, antimicrobial resistance, novel foods, advanced processing technologies, and environmental contaminants will require continuous generation of scientific evidence. By integrating research, surveillance, and science-based regulation, India can build a resilient food safety system that protects public health while supporting innovation, consumer confidence, and sustainable growth in the food sector. NS

(with inputs from M. Birundha, Young Professional–I, ICAR–National Research Centre for Banana (NRCB)

How India's Food Regulation Evolved



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Twenty years ago, food safety in India was largely about catching adulteration after it happened. Today, it is about preventing risks before they reach the consumer. The shift has been profound: a fragmented regulatory system has evolved into a unified, science-led framework supported by digital compliance, modern laboratories, risk-based inspections, consumer awareness and stronger alignment with global standards. The Food Safety and Standards Act, 2006 set this transformation in motion. Two decades on, India's food safety story is no longer just about regulation—it is about how science, technology, industry and consumers are reshaping what safe food means.



The food safety landscape in India has undergone a massive evolution over the last two decades. The country has gradually moved from a fragmented and largely reactive system focused on adulteration towards a modern, science-based and preventive framework. This transformation has not only changed the way food businesses are regulated, but has also expanded the role of consumers, technology, laboratories and global standards in ensuring food safety.

As India completes two decades of the Food Safety and Standards Act, 2006, it is worth looking back at the key milestones that have shaped this journey.

From PFA to FSSAI: The Legislative Shift

Between 2006 and 2011, India fundamentally changed the way it approached food safety. For more than five decades, the Prevention of Food Adulteration (PFA) Act, 1954, had been the principal legislation governing food adulteration and safety. However, as the food sector became more complex and modern food products and technologies emerged, the limitations of the existing framework became increasingly evident.

The PFA framework was largely focused on identifying and penalising adulteration. At the same time, food-related regulations were spread across multiple laws and government departments, creating complexity for food businesses. The regulatory system also struggled to adequately address the growing range of modern packaged and processed foods.

The turning point came with the enactment of the Food Safety and Standards Act (FSS Act) in 2006. The legislation brought together the various food-related laws under a single framework and established a science-based approach to food safety. Instead of focusing primarily on detecting unsafe food after it entered the market, the new framework emphasised safety across the food chain, from farm to plate.

The Food Safety and Standards Authority of India (FSSAI) was subsequently established in 2008 to implement the new regulatory framework. Over the following years, the authority worked towards developing a unified system of food standards and regulations. The transition was completed in August 2011, when the Food Safety and Standards Regulations came into effect, effectively replacing the earlier PFA-centric system.

The change represented more than just a shift in legislation. It marked a transition from a concept of "pure food" towards one centred on scientifically established food safety standards. Eight earlier food-related laws were repealed and brought under the umbrella of the new framework. Regulatory attention

also began moving beyond inspection and enforcement towards monitoring, preventive controls and greater responsibility for food businesses themselves.

The licensing and registration system further brought food businesses under a formal regulatory framework, with requirements determined by the nature and scale of their operations. In effect, India moved into a new era in which food safety was increasingly viewed through the lens of science, prevention and modern risk management.

Digitalisation and Simplified Compliance

The next significant phase of the transformation was the digitalisation of food regulatory processes. The earlier paper-intensive systems gradually gave way to centralised digital platforms, making licensing, registration and compliance more streamlined.

The Food Licensing and Registration System (FLRS) evolved into the Food Safety Compliance System (FoSCoS), creating a more integrated digital environment for food businesses. From small food vendors and retailers to large domestic and multinational companies, millions of Food Business Operators (FBOs) were brought into a common digital system.

Digitalisation also strengthened regulatory enforcement. With greater access to information and data, authorities could move towards risk-based inspections rather than relying primarily on random or routine inspections. This enabled regulatory attention to be directed towards food businesses and sectors presenting greater potential risks. Thus, technology became not merely an administrative tool, but an important component of a more



targeted and efficient food safety system.

Building Testing and Laboratory Capacity

A modern regulatory system can only be as strong as its ability to test and verify food safety. Over the past two decades, India has therefore placed increasing emphasis on strengthening its food testing and laboratory infrastructure.

The country has developed a wider network comprising National Reference Laboratories, FSSAI-notified private laboratories and state public health laboratories. This expansion has helped improve the availability and reach of food testing facilities across the country.

Another important development has been the introduction of mobile food testing laboratories, including the "Food Safety on Wheels" (FSW) units. These mobile laboratories have enabled rapid testing for adulteration and other food safety parameters, particularly in rural and semi-urban markets where access to conventional laboratory infrastructure may be limited.

At the same time, testing protocols and laboratory practices have increasingly moved towards internationally recognised standards, including ISO/IEC 17025. This has helped strengthen confidence in the quality and reliability of food testing and has supported India's integration with international food safety and trade systems.

From Regulation to Consumer Empowerment: The Eat Right India Movement

Over time, it became clear that regulation alone could not deliver better public health outcomes. Consumers also needed greater awareness about what they eat, how food is prepared and how their choices influence both health and the wider food system.

This thinking led to the Eat Right India movement, launched by FSSAI in the late 2010s. The initiative represented an important evolution in the regulatory approach—from simply regulating food businesses to actively engaging consumers and communities.

The movement is built around three broad pillars: Eat Safe, Eat Healthy and Eat Sustainable.

The "Eat Safe" component focuses on hygiene and food safety from farm to fork, including initiatives such as Clean Street Food Hubs and hygiene ratings for food establishments. "Eat Healthy" promotes balanced nutrition and encourages consumers to reduce excessive consumption of salt, sugar and oil, including through campaigns such as "Aaj Se Thoda Kam". The third pillar, "Eat Sustainable", focuses on environmentally responsible food choices, food waste reduction and initiatives such as RUCO, which promotes the conversion of used cooking oil into biodiesel.

The movement has also sought to make food safety and nutrition more visible at the point

of consumption. Hygiene-rating systems provide consumers with information about the cleanliness of food establishments, while initiatives such as the fortification logo help consumers identify fortified food products.

The concept has been extended to larger ecosystems through initiatives such as Eat Right Campuses and Eat Right Stations, which seek to create environments where healthier food choices, hygiene and food safety become part of everyday life.

Digital tools have further strengthened consumer participation by making information more accessible and providing mechanisms through which consumers can raise complaints or seek information about food safety.

This represents a significant change in philosophy. Instead of treating consumers merely as recipients of regulation, the system increasingly recognises them as active participants in food safety. As consumers demand safer and healthier food, businesses are encouraged to improve their practices in response.

Regulating the E-Commerce and Modern Retail Boom

The rapid growth of online food delivery and quick-commerce platforms has created another new dimension for food safety regulation. The traditional model of inspecting physical food establishments has had to evolve as food businesses increasingly operate through digital platforms.

The growth of platforms such as Swiggy and Zomato, along with the expansion of online grocery and quick-commerce services, has brought cloud kitchens, delivery operations and last-mile logistics into greater regulatory focus.

FSSAI has consequently expanded compliance requirements for food businesses operating through digital channels. Issues such as the display of food information, hygiene ratings, expiry-date visibility and safe handling during delivery have become increasingly important.

Temperature-controlled transportation and last-mile food safety have also emerged as critical considerations, particularly for products requiring specific storage conditions. The regulatory framework is therefore increasingly required to follow food beyond the physical premises of a restaurant, manufacturer or retailer and into the digital and delivery ecosystem.

International Harmonisation and Trade Facilitation

India's food regulatory evolution has also been closely connected with its growing role in international food trade. As agricultural and processed food exports have expanded and imports have increased, aligning domestic food standards with international benchmarks has become increasingly important.

India has actively worked towards harmonisation with international standards developed through the Codex Alimentarius Commission. Such alignment helps facilitate international trade while maintaining appropriate food safety requirements for products entering the Indian market.

At the same time, the Food Import Clearance System (FICS) has integrated food safety checks into the import clearance process at ports. By connecting regulatory checks with the customs process, the system aims to ensure that food products entering India undergo the necessary safety scrutiny while also reducing avoidable delays in cargo clearance.

This balance between stringent safety controls and efficient trade facilitation has become increasingly important as India seeks to strengthen its position in global food markets.

A Regulatory System Still in Evolution

The transformation of India's food regulatory system over the past two decades is therefore much larger than the transition from one food law to another. It represents a fundamental change in the philosophy of food safety—from a fragmented, largely reactive and enforcement-driven approach towards a system that is increasingly science-based, preventive, technology-enabled and consumer-oriented.

The journey has involved legislative consolidation, digitalisation, stronger laboratory infrastructure, risk-based enforcement, consumer awareness, regulation of emerging food-delivery models and greater alignment with international standards.

Yet, food regulation is not a finished process. India's food ecosystem continues to evolve rapidly, with new technologies, novel foods, changing consumption patterns, e-commerce models and global supply chains creating new regulatory questions.

The next phase of food safety will therefore require the same spirit of adaptation that has characterised the last twenty years. Stronger science, better technology, greater industry responsibility and an informed consumer base will all have a role to play.

From preventing adulteration to building a comprehensive food safety ecosystem, India's regulatory journey over the last two decades has been one of significant transformation—and the next chapter is already underway. NS

Making Safety Work Across the Food Chain



Munish Sharma,
Chief Operating Officer, Food Services, Compass Group India

India's food safety story is no longer just about preventing adulteration or meeting regulatory requirements. Over the past two decades, it has evolved into a powerful enabler of trust, operational resilience and business competitiveness. From digital licensing and risk-based inspections to traceability, AI-enabled monitoring and smarter cold chains, food safety is increasingly being built into the way India's food businesses operate. As the food economy becomes more complex and consumers demand greater transparency, safety is moving from the compliance desk to the heart of business strategy—shaping how food is produced, handled, served and trusted.



A dhaba owner in a small town scans a QR code before he even opens for the day, checking whether his licence needs renewal. It sounds like a small thing. It isn't. Twenty years ago there was no code to scan and, in most parts of the country, no real system behind it either, just a patchwork of laws dating back to the 1954 Prevention of Food Adulteration Act and a general sense that compliance was paperwork you did to avoid trouble, not something that actually mattered.

The Food Safety and Standards Authority of India (FSSAI) changed that, slowly and then not so slowly. FSSAI was set up in 2006 to pull India's scattered food laws into one science-based framework, and over the two decades since, it has built out nationwide licensing, risk-based inspections and tiered enforcement on top of that foundation. The digital push came later and mattered more than people expected: the cloud-based FoSCoS platform launched in 2020, followed by mobile apps that let ordinary consumers file feedback or check a licence themselves. Compliance got faster. It also, for the first time, got transparent.

None of this was abstract policymaking. The recent revision of turnover thresholds, with basic registration extending up to Rs 1.5 crore, is a good example of proportionate regulation: smaller food businesses face simpler compliance, while larger and multi-site operators continue to be held to more rigorous standards. There's a softer side to this too, harder to put a number on. FSSAI has spent years running programmes like Eat Right India and FoSTaC training, handing out five-star hygiene ratings, pushing oil-recycling drives and better school and hospital menus, and somewhere in all of that the culture actually started to shift, not just the paperwork. You can see it in the way people talk about food safety now compared to a decade ago, and in the way food safety has become part of everyday consumer expectations, not just regulatory vocabulary.

Walk into an institutional kitchen today, whether it's feeding a corporate cafeteria or a hospital ward and food safety isn't a side concern, it's the whole job, one lapse can sicken hundreds of people or shut down production entirely. FSSAI now requires large operators to hold valid licences and hit detailed standards, with real financial consequences for anyone who doesn't. That pressure has pushed the industry toward HACCP and ISO 22000 certification almost as a baseline expectation. For large-scale food service operators, food safety is not a department or a checklist. It is an operating system. It determines vendor selection, menu planning, kitchen design, training intensity, cold-chain discipline, audit frequency and, ultimately, client trust. In our sector, the difference between compliance and excellence is often

decided before the first meal is cooked.

And the payoff shows up in strange places. For employers, safe and trusted food at work contributes to employee confidence, workplace wellbeing and the credibility of the overall employee experience. A modern canteen will hang its FSSAI licence and hygiene score next to the menu like it's something to be proud of.

The productivity case is also compelling. The World Bank has estimated global productivity losses from foodborne illness at $110 billion annually across low- and middle-income countries. More broadly, McKinsey has estimated that improving worker health, including nutrition and prevention-led health interventions, could unlock trillions of dollars in economic value globally. Food safety is one practical, daily lever within that larger health-and-productivity equation. Put simply, every meal that doesn't make someone ill is one more productive day on a factory floor or in an office.

Operationally, this has meant quality control woven into every link of the chain rather than bolted on at the end. Kitchens are getting smarter: IoT sensors track refrigeration and cooking temperatures in real time, throwing alerts before food actually spoils, while predictive analytics try to forecast contamination risk using weather patterns, supplier history, lab results. Big caterers run dashboards that track waste and supplier audits across dozens of sites at once. And in places where a single incident simply isn't an option, a vaccine rollout site, a large hospital, operators are layering on barcode scanning and QR traceability so that any ingredient can be traced straight back to its source.

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The regulatory posture itself has changed too, moving from reactive to something closer to proactive. FSSAI's digital recall portal has turned what used to be a quiet, awkward process into routine public data: Between 2024 and 2026, public recall data shows at least 154 food recall records, with regulatory authorities initiating a majority of them. That points to a system becoming more visible, more active and more willing to put non-compliance into the public domain. By mid-2022 it had recognised 224 food-testing laboratories, 145 of them private, and put 254 mobile "Food Safety on Wheels" units on the road to reach places a fixed lab never would.

Globally, India is catching up in some places and charting its own path in others. The EU is piloting TraceMap, an AI platform that cross-references shipment and inspection data to catch fraud



buried deep in supply chains. Singapore and Australia are betting on blockchain and RFID for farm-to-fork traceability. The US FDA's Food Safety Modernization Act shifted the American approach toward prevention rather than response. India is following suit, with FSSAI's digital platforms, recall systems and state-level compliance infrastructure gradually shifting the system from response to prevention.

There's a reason QR-code traceability is moving from nice-to-have to expected: people actually want to know where their food came from now, not just whether it's safe, and that curiosity about origin and handling and even carbon footprint is pulling regulation along behind it. Some of the more interesting developments are happening quietly, in places like solar dryers for grains or cold chains that can sense when something's about to spoil before it does, cutting waste and risk in the same stroke. Novel foods will test all of this soon enough. Plant-based proteins and fermentation-derived ingredients are already on shelves in small ways, cultivated meat is coming, and FSSAI has said pre-market approval will apply to these categories too, working with startups now rather than waiting until there's a problem to solve.

AI is already showing up in both the kitchen and the compliance office, sometimes literally: a camera that flags an improperly worn glove, an algorithm quietly scanning sales data for the early signs of an outbreak. Indian food-tech firms are offering AI-powered hygiene monitoring now, and predictive maintenance tools use sensors to catch a failing refrigerator or boiler before it actually fails, which matters because a few degrees of temperature drift is often all it takes for pathogens to start multiplying.

Globally, India is catching up in some places and charting its own path in others. The EU is piloting TraceMap, an AI platform that cross-references shipment and inspection data to catch fraud buried deep in supply chains. Singapore and Australia are betting on blockchain and RFID for farm-to-fork traceability. The US FDA's Food Safety Modernization Act shifted the American approach toward prevention rather than response. India is following suit, with FSSAI's digital platforms, recall systems and state-level compliance infrastructure gradually shifting the system from response to prevention.

What all of this buys, ultimately, isn't just fewer illnesses. It's trust, and with 84 per cent of Indians naming food safety as a top concern, that trust has real commercial value attached to it. A school or a hospital picks its caterer partly on the strength of a spotless kitchen and traceable supply. An exporter can only sell spice or shrimp abroad if the buyer trusts the certificate that comes with it. As one industry veteran puts it, "trust is the most valuable ingredient in our business." Companies have started spending on food safety the way they'd spend on marketing, because in a sense, it's become the same thing.

Twenty years in, operators use these protocols for more than avoiding fines. They're reassuring everyone downstream, from parents to procurement officers, that the meal in front of them is exactly what it claims to be. And the centre of gravity keeps shifting further down the chain, toward the kitchen counter rather than the lab, which is probably the point.

There's a real opening here for India to set the benchmark rather than chase someone else's, if it can keep pairing emerging science with digital infrastructure and a workforce that actually knows what it's doing. The next decade will belong to organisations that treat food safety by design as a business discipline, built into farms, supplier networks, kitchens, menus, training and technology from the start. For India, the opportunity is not merely to catch up with global benchmarks, but to shape them. In the last twenty years, food safety has moved from being a regulatory obligation to becoming a foundation of trust, productivity and competitiveness. That is the real transformation. NS



When Science Took the Lead



Shilpa Aggarwal,
Vice President & Head of Operations, Ind Food and Beverage Association (IFBA)

India's food safety regime has evolved significantly over the past two decades—from a fragmented, compliance-driven system to a science-based regulatory framework. The Food Safety and Standards Act, 2006, placed science, risk assessment and robust testing at the heart of food regulation, strengthening consumer protection while supporting innovation and industry growth. As India's food ecosystem becomes more complex, these pillars will be critical to building greater trust, enabling trade and keeping pace with emerging food technologies.

India's food regulatory framework has undergone a fundamental transformation over the past two decades. Under the Prevention of Food Adulteration (PFA) Act, 1954 and the Rules framed thereunder, the regulatory focussed largely on adulteration and enforcing compliance through prosecution. While the PFA regime played a critical role in addressing food adulteration during its time, it was primarily compliance-driven and operated through multiple fragmented laws administered by different Departments and Ministries, for example AGMARK, BIS. As the food industry evolved with technological advancements, global trade, innovative products and increasingly complex supply chains, the need for a modern, integrated regulatory framework with internationally accepted norms of food safety as prescribed by CODEX became evident.

The enactment of the Food Safety and Standards Act, 2006 (FSS Act), together with the Rules and Regulations notified thereunder, marked a paradigm shift in India's approach to food regulation. Instead of focusing solely on end-product compliance, the new framework embraces science, risk assessment and evidence-based decision-making for food safety. It consolidated various food laws under a single legislation, established the Food Safety and Standards Authority of India (FSSAI) as the apex regulator, institutionalised independent scientific evaluation through Scientific Panels and the Scientific Committee, promoted stakeholder consultation during the development of or revisiting existing regulations, strengthened laboratory infrastructure and food safety management systems across the food chain.

Today, as India's food ecosystem continues to diversify with new technologies, novel ingredients, organised retail, e-commerce and expanding global trade, science, risk assessment and testing infrastructure have become the cornerstones of effective food regulation. Together, they ensure that regulatory decisions are transparent, evidence-based and proportionate, thereby strengthening consumer confidence while providing the food and beverage industry with a predictable and progressive regulatory environment.

Science at the Heart of Food Regulation

The FSS Act envisages that food standards should be developed on sound scientific principles rather than administrative discretion. Whether prescribing limits for contaminants, approving food additives, developing food product / packaging standards, regulating novel ingredients or establishing labelling requirements, scientific evidence forms the basis of regulatory decisions. Technical proposals undergo rigorous evaluation by Scientific Panels comprising experts from disciplines such as food science, food technology, toxicology, microbiology, nutrition, chemistry, agriculture and public health. These panels examine available scientific literature, international benchmarks, toxicological evidence, analytical capabilities and emerging research before making recommendations. Their conclusions are subsequently reviewed by the Scientific Committee, which harmonises scientific opinions across sectors before recommendations are considered for regulatory notification.

Equally important is FSSAI's commitment to stakeholder consultation to enhance transparency and garner more scientific support from the academic and related sector like food nutrition, packaging etc. Proposed regulatory amendments or new insertions, draft regulations, finalised notifications and matters of importance arising from consumer complaints / social

media are routinely placed in the public domain, inviting comments from industry, academia, consumer organisations, scientific institutions, enforcement agencies and other stakeholders. This consultative process enables regulators to balance scientific evidence with practical implementation considerations, ensuring that regulations remain both technically robust and operationally feasible. Such transparency has significantly strengthened the credibility and acceptance of India's food regulatory framework.

Strengthening India's Food Testing Ecosystem

Scientific regulation is only as effective as the infrastructure available to verify compliance. Recognising this, FSSAI has made substantial efforts over the past decade in ensuring India's food testing ecosystem is credible with analytical reliability at par with any other international lab of repute. The expansion of laboratory capacity has significantly improved the country's ability to detect contaminants such as pesticide residues, heavy metals, naturally occurring toxins, Polychlorinated Biphenyls (PCBs) and food safety concerns such as physical, chemical, microbiological and radiological hazards with greater precision and reliability. A noteworthy achievement has been the development of a nationwide network of recognised food testing laboratories supported by National Reference Laboratories, state food laboratories and private laboratories authorised under the FSS Act.

An important pillar of this ecosystem is the Integrated Scheme of Assessment wherein the audits and certifications are conducted jointly by FSSAI and the National Accreditation Board for Testing and Calibration Laboratories (NABL). This joint assessment mechanism has substantially improved confidence in laboratory performance and analytical reliability while ensuring testing capabilities and systems as per ISO 17025 requirements and analytical capacity as per Food Safety and Standards regulations.

The Way Forward: An Industry Perspective

From an industry standpoint, the progress made by FSSAI in institutionalising science-based regulation deserves recognition. The transparent regulatory architecture, structured scientific review process and sustained strengthening of testing infrastructure have enhanced regulatory predictability while reinforcing consumer confidence.

As India's food ecosystem continues to evolve in complexity, there is a significant opportunity to further strengthen its science-based regulatory framework. The Ind Food & Beverage Association (IFBA) believes this can be achieved through deeper institutional collaboration, greater reliance on scientific evidence generated in India, and more predictable regulatory processes. Priority areas include streamlining issuance of Gazette notifications and adoption of science- and geography-based Maximum Residue Limits (MRLs) for contaminants rather than direct alignment with standards developed for other jurisdictions such as the US and EU.

Regulatory decisions should consistently be guided by robust scientific risk assessment and evidence, rather than external narratives or social media discourse. Further, any significant regulatory change affecting long-established industry practices should be preceded by meaningful stakeholder consultation and a reasonable transition period to facilitate effective implementation. The recent issuance of social media notices by FSSAI regarding the use of fanciful brand and trade names highlights the importance of consultative and predictable regulatory decision-making.

Further investments in state food laboratories, harmonisation of analytical capabilities across regions and wider adoption of digital laboratory information systems would improve consistency and testing timelines. Establishing structured mechanisms for regular interaction between Scientific Panels and recognised scientific academic societies could also facilitate faster incorporation of emerging research into regulatory deliberations. Finally, greater emphasis on risk communication would help bridge the gap between scientific evidence and public perception. Timely dissemination of evidence-based information on food safety issues can counter misinformation, strengthen consumer confidence and promote informed decision-making. In an increasingly digital information environment, communicating the science behind regulatory decisions is becoming as important as the regulations themselves.

Conclusion

Science, risk assessment and testing infrastructure have become the three defining pillars of India's modern food safety regulatory system. With a regulatory framework that integrates independent scientific evaluation, transparent stakeholder consultation and robust laboratory support into every stage of regulatory decision-making, India can build a food safety ecosystem that is not only compliant with global standards but also recognised internationally as a benchmark for scientific and responsive regulation that protects public health while enabling innovation, facilitating trade and fostering consumer trust. NS

The Digital Turn in Food Safety



Suresh Garg,
Founder and Managing Director, Zeon Lifesciences

Two decades after the Food Safety and Standards Act, 2006, India's food safety ecosystem is entering a new phase—driven by digitisation. From licensing and inspections to laboratory testing, surveillance and traceability, digital systems are reshaping how food safety is governed, monitored and enforced.

The year 2026 marks two decades since the enactment of the Food Safety and Standards Act, 2006 (FSS Act), a landmark legislation that fundamentally reshaped India's approach to food safety regulation. The Act sought to consolidate the fragmented food laws and establish a science-based, integrated regulatory framework for ensuring that food available to consumers is safe and wholesome. The establishment of the Food Safety and Standards Authority of India (FSSAI) under the Act provided an institutional foundation for regulating food businesses across a rapidly expanding and increasingly complex food sector.

Over the past twenty years, India's food system has undergone significant transformation. Urbanisation, organised retail, e-commerce, food delivery platforms, processed foods, global supply chains and changing consumer preferences have created new challenges for regulators. Against this background the digitisation of food safety governance and compliance systems has emerged as one of the most important developments in the implementation of the FSS Act.

From fragmented regulation to integrated governance

Before the FSS Act, food safety regulation in India was governed through several laws, orders and regulatory mechanisms dealing with different categories of food products. The FSS Act provided a unified legal framework and moved the regulatory approach towards science-based standards, risk assessment and greater accountability of food business operators. Digitisation has strengthened this institutional transformation. Instead of relying predominantly on physical files, manual applications and fragmented communication, food safety administration has increasingly adopted online platforms for licensing, registration, inspection, laboratory processes, surveillance and compliance management. This has enabled regulators to handle a very large and diverse food business ecosystem more systematically.

The digital transition is significant because food safety governance involves multiple stakeholders—regulators, food manufacturers, importers, retailers, laboratories, consumers and enforcement authorities. Digital systems provide the possibility of connecting these stakeholders through common databases and standardised processes.

Digitisation of licensing and compliance

One of the most visible outcomes of digital governance has been the transformation of the licensing and registration process for food businesses. Online systems have reduced dependence on physical documentation and enabled businesses to submit applications, upload documents, track applications and manage regulatory requirements electronically.

For food business operators, this represents a shift from primarily paper-based compliance towards a more transparent and traceable system. Digital records can also help authorities monitor the status of licences, identify non-compliance and maintain updated information about businesses operating within the food supply chain.

The expansion of digital compliance systems is particularly important for India's large number of small and medium food businesses. At the same time, it highlights the need for simple interfaces, multilingual resources, awareness programmes and assisted digital services so that smaller operators are not disadvantaged by technological requirements.

Digital inspection, surveillance and enforcement

Digitisation has also created opportunities to make food safety inspections more systematic and data-driven. Digital inspection tools can standardise inspection procedures, record observations electronically and facilitate faster transmission of information to regulatory authorities. Such systems can improve accountability by creating an auditable record of regulatory actions.

The larger potential lies in the use of data for risk-based food safety surveillance. Information collected from licensing, inspections, sampling, laboratory testing, complaints and enforcement actions can be analysed to identify patterns and emerging risks. Instead of treating all food businesses or products identically, regulatory resources can increasingly be directed towards areas presenting higher food safety risks. This represents an important evolution from traditional compliance models towards preventive and evidence-based regulation.

Laboratory networks and traceability

Food testing is another critical component of the food safety system where digitisation can deliver significant benefits. Digital laboratory management and electronic transmission of testing information can improve the traceability of samples and reduce delays in communication between laboratories and regulatory authorities. In the longer term, the integration of regulatory databases with laboratory information, food sampling results and supply-chain information could create a more comprehensive picture of food safety risks. Such integration would help regulators respond more rapidly to contamination incidents and identify recurring problems.

Digital traceability is particularly relevant in an increasingly interconnected food supply chain. When a food safety incident occurs, the ability to identify the source, movement and distribution of a product can substantially improve the effectiveness of recalls and corrective action.

Empowering consumers and food businesses

The digital transformation of food safety governance is not limited to government administration. It has also changed how consumers and food businesses interact with the regulatory system. Online access to information, complaint mechanisms, food safety advisories and regulatory resources can improve consumer awareness and participation.

For businesses, digital platforms can provide access to standards, guidance documents, training resources and compliance information. This can encourage a culture in which food safety is viewed not merely as an enforcement obligation but as an integral part of responsible business practice. The increasing importance of digital food delivery and e-commerce has further expanded the relevance of such systems. Food safety regulation must now address not only traditional establishments but also digitally enabled food businesses, cloud kitchens, online marketplaces and complex delivery networks.

Challenges in the digital transition

Despite substantial progress, digitisation should not be viewed as an end in itself. Technology can improve efficiency, but effective food safety governance ultimately depends on institutional capacity, skilled personnel, reliable laboratories, enforcement and cooperation among stakeholders.

The digital divide remains an important concern. Small businesses, informal food operators and enterprises in areas with limited digital connectivity may face difficulties in navigating online systems. Excessive procedural complexity can also turn digital compliance into a burden rather than an enabler. Data quality, cybersecurity and privacy are additional concerns. Regulatory decisions based on inaccurate or incomplete data can undermine the value of digital systems. Therefore, strong data governance, interoperability, security safeguards and regular system improvement are essential. There is also a need to ensure that technology complements rather than replaces professional judgement. Artificial intelligence, analytics and automated risk assessment can support regulators, but food safety decisions require scientific expertise and contextual understanding.

Looking ahead

As India enters the next phase of food safety governance, the objective should be to move from simple digitisation of existing procedures towards intelligent, integrated and preventive digital regulation. Interoperable databases, real-time surveillance, stronger laboratory networks, digital traceability and risk-based analytics can create a more responsive food safety ecosystem.

The next generation of digital governance should also focus on making compliance easier for businesses. A well-designed system should enable a food business operator to understand what is required, complete the process efficiently and receive timely regulatory feedback. Technology should reduce unnecessary administrative burdens while strengthening accountability.

The next twenty years will require the integration of technology with science, institutional capacity and stakeholder participation. If pursued inclusively and responsibly, digital transformation can help India build a food safety system that is not only more efficient for regulators and businesses but also more responsive to the fundamental objective of the FSS Act: protecting public health and ensuring that every consumer has access to safe and wholesome food. NS

What Comes After Compliance?



Sanjay Jain,
Director, Elanpro

Twenty years after the Food Safety and Standards Act, India's food safety ecosystem has evolved from fragmented regulation to a more unified, science-based and technology-enabled framework. As FSSAI enters its third decade, the focus is shifting towards stronger traceability, digital compliance, testing, sustainability and consumer protection.

The year 2006 marked a historic watershed moment for India's food safety landscape. Prior to the passage of the landmark Food Safety and Standards Act (FSS Act) of 2006, India's food regulatory ecosystem was governed by a fragmented web of outdated laws. Multiple ministries oversaw disparate statutes, ranging from the Prevention of Food Adulteration Act of 1954 to various commodity-specific orders such as the Fruit Products Order and Meat Food Products Order. This overlapping regulation created compliance confusion for businesses while leaving significant gaps in public health monitoring. The enactment of the FSS Act of 2006 dismantled this fragmented approach by establishing a unified, science-based regulatory architecture under a single apex body: the Food Safety and Standards Authority of India (FSSAI). As India marks twenty years of the FSS Act in 2026, the nation reflects on a transformative two-decade journey that has elevated food safety from an administrative afterthought to a national economic and public health priority.

The Evolution of India's Food Regulatory Framework

The evolution of India's food safety ecosystem over the last two decades can be categorised into distinct developmental phases: consolidation, capacity building, and preventive governance.

In its initial years, FSSAI focused on integrating multi-departmental mandates, creating standardised definitions, and establishing a single-window licensing framework. The transition was not merely administrative; it represented a fundamental paradigm shift from "adulteration control", a purely punitive model, to a holistic "food safety management" framework. Under this philosophy, responsibility was shared across the entire supply chain, requiring Food Business Operators (FBOs) to adopt proactive hygiene and safety protocols.

Over time, regulatory scope expanded beyond basic hygiene to address lifestyle-related health challenges. The launch of national initiatives such as the Eat Right India movement integrated consumer awareness with systemic reform. FSSAI shifted public discourse towards reducing high fat, sugar, and salt (HFSS) consumption, eliminating industrially produced trans fats, and promoting fortification to combat micronutrient deficiencies.

Landmark Reforms, Policy Interventions, and Enforcement Milestones

Over the last 20 years, FSSAI moved beyond basic inspections to actively shape public health and consumer awareness. Through the Eat Right India Campaign, the regulator introduced targeted efforts like "Aaj Se Thoda Kam" to encourage lower salt, sugar, and trans fat intake, alongside "Har Label Kuch Kehta Hai" to help shoppers understand nutrition panels. Recognising how many citizens rely on local street food vendors, programmes such as Clean Street Food Hubs, Eat Right Station, and Eat Right Campus brought informal stalls into structured hygiene systems with mandatory safety training and regular checks.

Digitisation of Food Safety Governance and Compliance

A major catalyst in scaling food safety governance across India's vast geography has been digital transformation. Paper-based licensing and manual inspection regimes have been replaced by centralised digital platforms that enhance transparency and reduce compliance friction. The Food Safety Compliance System (FoSCoS) serves as the central digital portal for licensing, registration, and annual returns, streamlining administrative processes for millions of FBOs. Digital integration extended into field inspections via FoSCoRIS (Food Safety Compliance Through Regular Inspection and Sampling), an app-based inspection system that enables food safety officers to conduct real-time, transparent audits using standardised digital checklists. At international

trade entry points, the Food Import Clearance System (FICS) uses automated risk-management software to speed up testing and clearance for incoming food shipments. Furthermore, public transparency was bolstered through online verification tools and the FSSAI Consumer App, allowing consumers and businesses to verify the authenticity of FSSAI licence numbers on product packaging. This digital grid has minimised manual discretion, sped up approval timelines, and created an auditable compliance trail across the supply chain.

Science, Testing Infrastructure and Risk Assessment

At the heart of the 2006 Act was the mandate that all food safety standards must be grounded in scientific risk assessment rather than arbitrary mandates. Over the past two decades, India has built a robust national food testing infrastructure to operationalise this vision.

The establishment of National Reference Laboratories (NRLs) alongside a network of NABL-accredited state and private food testing labs has significantly elevated India's analytical capabilities. State-of-the-art testing equipment now allows laboratories to detect trace contaminants, heavy metals, pesticide residues, and unapproved chemical additives with high precision. Furthermore, rapid testing kits deployed across state laboratories and mobile units have reduced sample turnaround times from several weeks to just a few minutes for everyday essential commodities like milk, ghee, spices, and cooking oils. To bridge the gap between urban centres and regional food hubs, FSSAI deployed Food Safety on Wheels (FSW), mobile laboratory vans equipped to perform rapid spot-testing for common adulterants, conduct awareness programmes, and train street food vendors on basic hygiene standards.

The Role of Elanpro: Championing Cold Chain Excellence and Food Safety

Beyond regulatory frameworks, maintaining safety standards on the ground relies heavily on modern equipment and cold chain reliability. Commercial refrigeration providers like Elanpro play a vital role in bridging regulatory goals with everyday operations by delivering specialised cooling solutions engineered to withstand demanding Indian weather conditions. For large commercial kitchens, Elanpro's Industrial Blast Freezers facilitate rapid cooling and temperature stabilisation, allowing operators to lock in food quality while adhering strictly to statutory hygiene norms.

To safeguard prepared foods at safe serving temperatures, their Hot and Cold Holding Cabinets keep ingredients out of the temperature danger zone. In retail environments where dairy and frozen products require exact temperature control from back-room storage to final display, versatile solutions like the Elanpro Combi Freezer tackle complex multi-category storage challenges. By managing dual temperature zones within a single footprint, ranging from 2°C to 8°C for chilled dairy items and -16°C to -25°C for frozen treats like ice cream, the unit prevents cross-contamination, maintains ideal product textures, and protects shelf life right at the final mile of retail delivery.

Looking Ahead: Emerging Priorities

As the Food Safety and Standards Act reaches its twenty-year milestone, the regulatory focus is shifting towards complex, modern challenges in a fast-moving marketplace:

- **Supply Chain Traceability:** End-to-end traceability is emerging as the cornerstone of modern food safety. Integrating digital tracking frameworks and serialised QR codes will prove crucial for curbing counterfeit products and enabling rapid, targeted product recalls when safety compromises occur.
- **Novel Foods and Functional Nutrition:** As consumer demand accelerates for health supplements, plant-based proteins, and alternative diets, structured evaluation pathways are essential to foster product innovation without compromising safety standards or permitting misleading health claims.
- **Environmental Sustainability:** FSSAI is increasingly linking food safety with ecological responsibility by enacting strict guidelines for recycled plastic packaging, curbing single-use materials, and expanding the Repurpose Used Cooking Oil (RUCO) initiative to divert commercial kitchen waste into biodiesel production.
- **Front-of-Pack Labelling:** To combat the growing burden of lifestyle-related diseases, establishing a clear, standardised front-of-pack labelling framework is vital. Intuitive visual cues highlighting high levels of fat, sugar, and sodium will empower consumers to make informed dietary choices in seconds.

Building a Safe and Sustainable Future

Over two decades, India's approach to food safety transformed from a collection of outdated rules into an organised, tech-enabled system. By balancing practical enforcement with support for small businesses and clear information for buyers, FSSAI has laid down a framework where safe, quality food is treated as a basic standard for everyone. NS

Building Food Safety Through Shared Responsibility



Dr Shaheen Majeed
(D.Litt.), Global CEO & Managing Director, Sami-Sabinsa Group

Food safety has evolved far beyond the realm of regulatory compliance. Today, it is the foundation of consumer confidence, a catalyst for industry growth, and a defining pillar of a resilient and sustainable food ecosystem. Consumers are better informed than ever before, seeking transparency, scientific validation, quality assurance, and authenticity in the products they buy. This shift has fundamentally redefined the responsibility of food and nutraceutical manufacturers, pushing to uphold the highest standards of safety and quality at every stage—from sourcing raw materials to delivering finished products.

Having spent decades in the nutraceutical and botanical ingredients industry, I have witnessed India's food safety landscape undergo one of its most significant transformations. The enactment of the Food Safety and Standards Act (FSSA), 2006, and the subsequent establishment of the Food Safety and Standards Authority of India (FSSAI) in 2008 marked a watershed moment in India's regulatory journey. For the first time, the country adopted a unified, science-based framework that brought clarity, consistency, and accountability to food regulation. As we commemorate two decades of the Food Safety and Standards Act, it is an appropriate moment not only to celebrate this remarkable milestone but also to reflect on how far India has progressed and to envision the path ahead.

From Fragmented Regulation to a Unified Food Safety Framework

India's journey toward a robust food safety ecosystem has been both challenging and inspiring. Historically, food regulation was governed by multiple laws administered by different authorities, often resulting in overlapping jurisdictions, inconsistent enforcement, and regulatory ambiguity. In a country as vast and diverse as India, such fragmentation inevitably created challenges in ensuring uniform food safety standards and eroded consumer confidence. Earlier legislation, including the Prevention of Food Adulteration Act, 1954, played an important role in addressing food adulteration. However, the regulatory philosophy at the time was largely reactive, focusing on penalising violations rather than creating a preventive, risk-based food safety system.

The introduction of the Food Safety and Standards Act fundamentally transformed this approach. By establishing FSSAI as India's apex food regulator, the legislation consolidated multiple food laws under a single umbrella and ushered in a modern, science-driven regulatory framework aligned with global best practices. This transition has significantly strengthened food safety governance, improved regulatory transparency, and enhanced consumer protection nationwide. Today, India's food safety framework is increasingly recognised as balancing scientific rigor with industry growth, enabling innovation while safeguarding public health.

Food Safety Is a Shared Responsibility

While regulatory institutions set the framework, the responsibility for delivering safe, high-quality food ultimately rests with every stakeholder across the value chain. Food safety cannot be achieved through regulation alone; it requires a culture of responsibility, collaboration, and continuous improvement.

The industry plays a critical role in supporting FSSAI's vision by ensuring strict regulatory compliance, investing in scientific research, strengthening supply chain integrity, adopting digital traceability systems, and embracing globally accepted quality management practices.

At Sami-Sabinsa Group, this philosophy has guided us since our founding. As a science-driven organisation, we have always believed that quality is not merely tested into a product—it is designed into every stage

of its development. Our FSSAI-certified manufacturing facilities, internationally accredited quality systems, and commitment to rigorous scientific validation reflect our unwavering focus on delivering safe, effective, and reliable products to consumers worldwide.

In today's digitally connected world, conversations about food safety unfold instantly across social media and online platforms. This growing public scrutiny is a positive development because it encourages greater transparency and accountability. It also reinforces the need for regulators and industry to remain proactive, responsive, and committed to continuous improvement.

Strong food safety practices do more than protect public health, they strengthen consumer trust, enhance India's export competitiveness, and elevate the country's reputation as a reliable global supplier of high-quality food and nutraceuticals.

Strengthening India's Nutraceutical Ecosystem

One of the most exciting developments in recent years has been the rapid growth of India's nutraceutical sector. Consumers today increasingly recognise the value of preventive healthcare and actively seek scientifically validated functional foods, dietary supplements, and botanical ingredients that support long-term wellness.

However, with rapid growth comes greater responsibility.

The long-term success of the nutraceutical industry depends on maintaining uncompromising standards of safety, efficacy, and quality. Scientific substantiation of health benefits, standardisation of botanical ingredients, robust quality assurance systems, transparent labeling, and responsible communication are no longer optional—they are essential.

FSSAI's evolving regulatory framework for nutraceuticals has brought much-needed clarity to manufacturers and strengthened consumer confidence. Equally significant has been the emphasis on Good Manufacturing Practices (GMP), which ensure that products are consistently manufactured under controlled conditions, using validated processes, trained personnel, hygienic facilities, and rigorous quality control systems. For companies like ours, these principles have always been the cornerstone of responsible manufacturing. As scientific understanding advances and consumer expectations continue to evolve, manufacturers must remain agile, continuously reviewing and strengthening their processes to stay aligned with emerging evidence and regulatory developments.

India has a unique advantage in this space. Our rich heritage of traditional botanical knowledge, when combined with modern scientific research and robust regulatory oversight, positions the country to become a global leader in nutraceutical innovation. Realising this opportunity will require sustained collaboration among regulators, academia, researchers, and industry to ensure that innovation is always accompanied by scientific credibility and consumer safety.

Shaping the Future of Food Safety

The future of food safety will be increasingly shaped by science, technology, and data-driven decision-making. Encouragingly, FSSAI has already begun laying the -groundwork for this next phase through initiatives that strengthen food testing infrastructure, promote digital traceability, foster stakeholder engagement, and align India's standards with evolving international benchmarks. Equally important is cultivating a culture of food safety across the ecosystem. Continuous education, professional training, scientific capacity building, and consumer awareness will play an indispensable role in ensuring that food safety becomes an organisational mindset rather than merely a regulatory obligation.

Looking Ahead

The twentieth anniversary of the Food Safety and Standards Act is far more than a legislative milestone—it marks India's collective commitment to safeguarding public health through science, innovation, and responsible governance.

The remarkable progress over the past two decades demonstrates what is possible when policymakers, regulators, researchers, and industry work together toward a shared purpose. Yet our journey is far from complete. As consumer expectations continue to evolve and new food technologies emerge, our collective responsibility will only grow.

I firmly believe that India's future as a global leader in food and nutraceutical innovation will be determined not only by the products we create but also by the trust we inspire. Trust is earned through uncompromising quality, scientific excellence, transparency, and a steadfast commitment to consumer well-being.

If we continue to uphold these values, India is exceptionally well positioned to build a food ecosystem for the future that is globally respected, grounded in science, committed to sustainability, and trusted by consumers worldwide. NS

The New Currency of Food Safety: Transparency



Dr Shilpa Vora,
Chief R&D Officer,
Marico Limited

India's food safety journey is increasingly a story of trust. As consumers become more informed and demanding, food safety is moving beyond compliance to shape how people judge products, brands and the systems behind them. Today, earning and sustaining consumer trust is becoming as important as ensuring the food itself is safe.

Food has always been central to India's culture, communities, and everyday lives. But in today's world, one ingredient matters as much as any other: trust.

Twenty years ago, food safety was largely an industry and regulatory conversation. Today, it is a consumer expectation. Indians are more informed, more connected, and more conscious about what they eat than ever before. They are not just choosing products; they are evaluating ingredients, scrutinising labels, seeking transparency, and rewarding brands that earn their confidence. This shift represents one of the most significant transformations in India's food ecosystem. The conversation has evolved from simply ensuring access to food to building confidence in every stage of the food journey. As a result, food safety is no longer just about compliance. It has become a cornerstone of consumer trust, brand credibility, and long-term business success.

India's progress over the last two decades has laid a strong foundation for this new era. The challenge now is not only to maintain high standards but to continuously raise the bar as consumer expectations evolve.

From Basic Necessity to Conscious Consumption: India Then vs. Now

Two decades ago, food purchasing decisions were mostly influenced by availability, affordability, familiarity, and trust. Most consumers bought products from local stores and relied heavily on recommendations from family members, friends, and retailers. Reading ingredient lists, checking nutritional information, or evaluating food labels was not a common consumer practice.

The food marketplace itself looked very different. Packaged food options were relatively limited, and consumers had little visibility into how food was sourced, manufactured, transported, or stored. Information was less accessible, and conversations around food safety rarely extended beyond industry circles.

However, India's economic growth, digital expansion, and increasing internet penetration have transformed the way people think about food. Consumers today have access to significantly more information and are increasingly interested in understanding what goes into the food they buy. According to PwC's Voice of the Consumer Survey 2025, 84 per cent of Indian consumers consider food safety an important factor when purchasing food products.

Labels, ingredients, certifications, nutritional content, and sourcing practices have become important considerations in purchase decisions. Food is no longer viewed solely as a necessity; it is increasingly seen as a contributor to health, wellness, and long-term well-being.

How Indians Are Rethinking Food

As lifestyles have evolved, so have the eating habits and food preferences of Indian consumers. Rapid urbanisation, demanding work schedules, and changing household structures have increased the demand for convenient food solutions. Ready-to-cook, ready-to-eat, and packaged food categories have expanded steadily as consumers seek products that fit seamlessly into modern lifestyles.

At the same time, convenience is no longer the only priority. Today's consumers are more health-conscious than ever before. There is growing demand for foods that support fitness, immunity, and overall well-being.

Products rich in protein, fortified with essential nutrients, and made with natural ingredients are increasingly finding favour among consumers.

Global food trends, digital platforms, and social media have also exposed consumers to a wider variety of cuisines, ingredients, and dietary preferences. As a result, consumers are exploring new food choices while becoming increasingly mindful of quality, nutrition, and safety.

The Journey of Food Safety in India

The evolution of India's food ecosystem has been accompanied by a parallel strengthening of its food safety framework.

The establishment and growth of institutions such as the Food Safety and Standards Authority of India (FSSAI) have played a crucial role in promoting food safety awareness and establishing common standards across the sector. Increased focus on food testing, hygiene practices, food labelling, compliance requirements, and traceability has strengthened the overall food safety environment.

Importantly, this progress has not been driven by regulators alone. Industry stakeholders, scientists, food experts, researchers, manufacturers, and policymakers have collectively contributed to raising food safety standards. Their combined efforts have strengthened quality assurance systems and built greater consumer confidence in the food ecosystem.

The Rise of the Smart Indian Consumer

One of the most significant developments over the last two decades has been the emergence of the informed consumer.

Today's consumers are more curious, aware, and engaged than ever before. Many routinely examine ingredient lists, nutritional information, and product labels before making purchase decisions. They compare products, seek information online, and evaluate claims before deciding what to buy.

There is also a growing demand for transparency. Consumers want to know where ingredients come from, how products are made, and whether they align with their health goals and lifestyle preferences. Increased awareness of nutrition, wellness, and food quality has encouraged people to ask important questions and seek greater accountability from food companies.

As a result, consumer expectations are increasingly shaping industry behaviour. Businesses are expected to provide clear information, maintain high safety standards, and communicate honestly and transparently about their products.

Brands Have a Bigger Responsibility Today

In today's environment, food safety begins long before a product reaches store shelves. It must be embedded across every stage of the value chain, from sourcing and manufacturing to storage, transportation, and distribution.

Consumers expect brands to consistently deliver on their promises of quality, safety, and nutrition. Trust has become one of the most valuable assets for any food company, and maintaining that trust requires continuous commitment, investment, and vigilance.

Transparency has become especially important. Consumers increasingly expect brands to communicate openly about ingredients, processes, and quality standards. Companies that prioritise honest communication, robust quality systems, and responsible business practices are better positioned to build long-term consumer confidence.

Investment in R&D, innovation, quality assurance, and food safety systems has become essential to meeting evolving consumer expectations. The most trusted brands are often those that place consumer well-being at the centre of every decision they make.

What Comes Next for Food Safety in India?

As we look ahead, the future of food safety in India will not be defined only by stronger regulations, better technology, or more advanced testing systems. It will be defined by trust.

In a world where consumers have more information and more choice than ever before, trust is becoming the most valuable currency for food brands. It is earned through consistency, transparency, scientific rigour, and an unwavering commitment to consumer well-being.

The next phase of India's food safety journey will require all stakeholders, regulators, industry, scientists, researchers, and consumers, to continue working together. Not because compliance demands it, but because consumer confidence depends on it.

India has come a long way in building a safer food ecosystem. Yet the real opportunity lies ahead: creating a future where every consumer can trust not just the food on their plate, but the systems, institutions, and brands behind it.

Ultimately, food safety is not merely about preventing risk. It is about enabling confidence. And in an increasingly informed and conscious society, that confidence will be the defining factor that shapes the future of India's food industry. NS

Securing Quality from Farm to Fork



Pradip Narayan Das,
Senior General Manager & Head - QA , Heritage Foods Limited

India's food safety journey over the past two decades is a story of transformation—from fragmented regulation and end-product testing to a more integrated, science-led and prevention-focused ecosystem. As food supply chains become more complex, digital and consumer-driven, the next chapter must go beyond compliance to build a culture of continuous assurance, accountability and trust across the entire food chain.

The most remarkable change in India's food safety journey over the last twenty years is not simply the growth of regulation, but the transformation of the food ecosystem itself. India's food ecosystem was largely local and relationship driven. Consumers often knew their milkman, neighbourhood grocery store or local sweet shop. Today, food moves across geographies, passes through organised retail, e-commerce and quick commerce, and includes an expanding range of new and specialised products. Choice has increased enormously but so has the distance between producer and consumer—and with it, the responsibility to ensure safety throughout the journey. In this changing landscape, the evolution of India's food regulatory framework has been one of the country's most important institutional transformations.

The establishment of the Food Safety and Standards Authority of India (FSSAI) brought greater unity and structure to India's food regulatory system and created a common language for food safety. Its contribution, however, goes beyond standards and regulations. Licensing, registration, training, surveillance, laboratory infrastructure and digital systems have progressively brought regulators, industry, laboratories, food handlers and consumers into a broader food safety ecosystem.

From Testing to Prevention

Perhaps the most important transformation of the last twenty years has been in the philosophy of food safety itself. Earlier, the emphasis was largely on adulteration, inspection and end product testing. Today, the focus is increasingly on prevention—through HACCP, GMP, GHP, supplier assurance, traceability, cold chain management and food safety culture. The question has fundamentally changed from "Is the finished product safe?" to "How do we design the entire food chain so that unsafe food is prevented in the first place?" This shift from detection to prevention is, in my view, one of the clearest indicators of maturity in India's food safety system.

The dairy sector demonstrates this particularly well. Milk is an unforgiving raw material. Safety begins at the source—with animal health, responsible veterinary practices, hygienic milking, rapid chilling and disciplined procurement—and continues through transportation, processing, storage and retail. Food safety cannot be tested into a product at the factory gate. If the raw material is compromised at source or the cold chain is broken later, end product testing may come too late. Source level surveillance, residue control, farmer engagement and transparent quality assessment must therefore remain central to food safety.

Science at the Heart of Food Safety

The future of food regulation must be increasingly science led. Strong testing infrastructure, competent laboratories, advanced analytical techniques, reliable data and robust risk assessment will be essential to manage an increasingly complex food ecosystem.

This is particularly relevant as consumers seek high protein, probiotic, fortified and specialised foods. Innovation should certainly be encouraged, but it must remain grounded in evidence. Claims should be measurable, benefits substantiated and shelf life supported by appropriate process and cold chain controls. Innovation may attract consumers, but consistent quality, safety and scientific evidence earn their trust.

Industry as a Partner, Not Just a Regulated Entity

Food safety cannot be achieved through enforcement

alone. Strong enforcement must remain non negotiable for deliberate violations and practices that put consumers at risk. At the same time, a mature regulatory system should educate, guide and enable businesses that genuinely want to comply.

From an industry perspective, regulatory requirements must be clear, science based, transparent and predictable. The objective should be uncompromising on consumer safety while making genuine compliance easier.

Bringing the Unorganised Sector into the Food Safety Mainstream

India's next major food safety opportunity lies in bringing its vast unorganised and small food business sector into the mainstream of the food safety ecosystem. Millions of small food businesses, street food vendors, sweet shops, restaurants, caterers, home based food businesses and traditional food producers serve consumers every day and form an integral part of India's food economy. For many of these businesses, the challenge is not necessarily a lack of intent, but limited access to knowledge, infrastructure, testing facilities, technical support and, at times, the complexity of compliance requirements. Simple guidance, local language training, affordable testing, mobile laboratories and accessible digital tools can help transform the unorganised sector from a compliance challenge into a partner in India's food safety mission.

The Last Mile

The next major challenge is the last mile, because food safety does not end at the factory gate. A product can leave a manufacturing facility in excellent condition and still reach the consumer incorrectly. Modern retail, e-commerce and quick commerce have created new distribution models involving dark stores, decentralised networks and faster delivery.

Cold chain integrity, storage, handling, shelf life and traceability can therefore no longer be considered solely the manufacturer's responsibility. Retailers, logistics providers and digital platforms are now active participants in the food safety chain. Accountability must extend from farm to factory and from factory to the consumer's doorstep.

This will make traceability increasingly important. The ability to identify the origin of a product, understand its movement and rapidly isolate a deviation will become an essential component of modern food safety.

The Next Generation of Food Safety

India's next phase should take us to continuous, risk based assurance. The regulatory system of the future must be firmly anchored in science based standards, supported by data driven surveillance and enabled by modern technology. Regulatory attention should increasingly be directed towards risks that have the greatest potential impact on consumer health, rather than applying the same intensity of oversight across every situation. Digital traceability, real time monitoring, advanced laboratory, data analytics and artificial intelligence can help identify emerging risks earlier and enable faster intervention. At the same time, enforcement should be proportional to the nature and severity of the risk—firm and decisive where consumer safety is compromised, while providing greater predictability and ease to businesses with demonstrated compliance. In this model, science defines the standard, risk determines the priority, data strengthens the decision and proportionate enforcement ensures accountability.

Building Confidence

Ultimately, the success of food regulation should not be measured only by the number of licences issued, inspections conducted or samples tested. These are important indicators, but the larger objective is confidence.

Consumers need confidence in the food they buy. Businesses need confidence that requirements are clear and consistently applied. Laboratories need confidence in their science. Regulators need confidence in the quality of data available to them. Entrepreneurs need confidence that doing the right thing will not put them at a competitive disadvantage.

A mature food safety system should therefore create trust, not fear. Compliance should become a competitive strength rather than merely a regulatory obligation.

From Foundation to Food Safety Culture

The success of food safety must be reflected in the everyday behaviour of millions of people across the food chain—the way food is sourced, handled, processed, transported, stored and consumed. When prevention becomes a way of working, compliance becomes embedded in everyday practice and assurance becomes continuous, food safety moves beyond a regulatory obligation to become a culture of responsibility and trust.

The first twenty years built the foundation. The next twenty must take that foundation to every corner of the food ecosystem and make food safety a way of working—not merely a requirement to be met.

That, in my view, is the real opportunity before India—and the true measure of the next chapter of its food safety journey. NS

Writing the Next Chapter of Food Safety



Paritosh Ladhani,
Joint Managing Director,
SLMG Beverages

India's next food safety decade will be defined not by new rules alone, but by how effectively regulation, traceability, technology and consumer awareness reach every layer of the food chain.

In August 2006, when the Food Safety and Standards Act received Presidential assent, India's food sector was governed by a tangle of at least half a dozen separate laws, each written for a different era and a different problem. The Prevention of Food Adulteration Act. The Fruit Products Order. The Meat Food Products Order.

A manufacturer selling packaged juice, milk and confectionery under one roof could find itself answering to three regulators for three products, none of whom necessarily agreed with each other. Two decades later, that fragmentation is a memory, and the Food Safety and Standards Authority of India (FSSAI), built on that single Act, has become the closest thing India has to a unified language for food safety.

For an industry like ours, working with fresh milk, dairy and health beverages sourced daily from farmers across Uttar Pradesh, this shift has not been academic. It has changed how we test, how we label and how quickly we can respond when something goes wrong.

From paperwork to platforms

The most visible change of the last decade has been the move from physical files to digital systems. The Food Safety Compliance System (FoSCoS), replaced a licensing process that once meant queues, courier trails and long waits for renewal. From April 2026, FSSAI further revised licensing turnover thresholds, with registration now applying up to Rs 1.5 crore in annual turnover, a state licence between Rs 1.5 crore and Rs 50 crore, and a central licence above that mark.

Street vendors and hawkers already registered under municipal vending schemes are now deemed registered under the food safety law too, sparing over ten lakh small operators a duplicate paperwork burden. These are not cosmetic tweaks. For a beverage company managing dozens of stock keeping units across states, a predictable, digital licensing trail is what allows scale without chaos.

Testing the food, not just the file

Regulation is only as credible as the science behind it. FSSAI now recognises 224 food testing laboratories across the country, comprising state government labs, private NABL-accredited facilities and referral laboratories for disputed samples, alongside 254 mobile Food Safety on Wheels units that carry basic testing capability into towns that never had a lab nearby.

This infrastructure matters more for beverages than most categories. Shelf life, microbial safety and nutrient claims on a health drink cannot rest on assumption. They need repeatable testing, and that testing now happens closer to where the product is made rather than only in a handful of metro labs.

What the next decade needs

The unfinished work is well known within the industry even if it rarely makes headlines. Traceability from farm to bottle is still inconsistent across smaller players. Novel food categories, from plant-based proteins to fortified functional beverages, need clearer, faster approval pathways if Indian companies are to innovate at the pace consumers now expect.

Sustainability is the quieter frontier. Packaging waste and water use in beverage manufacturing sit outside what food safety regulation traditionally covers, but they are fast becoming part of how regulators, retailers and consumers judge a brand's credibility, and FSSAI's own work on labelling and vegan food standards this year suggests the two conversations are beginning to merge. And consumer awareness, despite years of the Eat Right India campaign, still lags what urban India assumes it already knows about the food on its shelf.

None of this diminishes what twenty years have built. A regulator that started by consolidating old laws now sets the terms for testing, labelling and trust across a food economy of enormous scale. The next decade's task is narrower but harder, closing the gap between what the rules say on paper and what happens on the smallest shop floor. NS

The Borrowed Evidence Problem

India's nutraceutical industry cites a great deal of science, but much of it does not necessarily belong to the product in the tub. The evidence gap is becoming harder to ignore: 69.4 per cent of 36 protein supplements tested contained less protein than declared on the label, while nutraceuticals accounted for 52 per cent of all ASCI food and beverage cases in FY 2025–26, with 96 per cent of those cases requiring modification. Yet India has zero public registers tracking finished-product clinical evidence. As claim substantiation moves from paperwork to proof, the distinction between borrowed science and product-specific evidence could determine who builds credible, scalable brands—and who stalls.

Pick up almost any premium nutraceutical sold in India today and follow the science backwards. The pack carries a benefit statement. Somewhere on the label, or more often on the brand's website, sits a footnote pointing to a clinical study. Follow that footnote and you will usually arrive at a randomised controlled trial conducted on a single standardised botanical extract, frequently outside India, frequently sponsored by the ingredient supplier who sold that extract to fifteen other brands in the same category.

The study is real. The extract is real. The benefit may well be real. What is almost never true is that the study was conducted on the product you are holding.

This is the borrowed evidence problem, and it sits at the centre of the Indian nutraceutical industry's next decade. For fifteen years the sector has grown on a formulation-and-marketing model in which scientific credibility was procured alongside raw material. That model worked because nobody was checking the chain of custody between the study and the SKU. Three converging pressures are ending that arrangement: a regulator moving from licensing to claim scrutiny, an advertising watchdog that has made nutraceuticals its single largest area of food and beverage enforcement, and an export ambition that runs directly into dossier requirements no borrowed study can satisfy.

The measurement gap comes first

Before diagnosing the evidence gap, it is worth being honest about a second gap sitting on top of it. India has no register of nutraceutical evidence.

The Clinical Trials Registry-India was established in 2007 and made mandatory for regulatory trials by the Drugs Controller General of India in 2009. It is a WHO primary registry and it captures interventional studies across drugs,



69.4%	52%	96%	0
of 36 protein supplements tested carried less protein than the label declared	of all ASCI food and beverage cases in FY 2025-26 were nutraceuticals	of those nutraceutical cases required modification	public registers in India that count finished-product clinical evidence

devices, AYUSH interventions and behavioural research. What it does not do is tag studies by whether the intervention was a marketed finished product or a raw ingredient, nor does it distinguish a nutraceutical from a functional food from a food for special medical purpose in any way that supports clean counting.

The FSSAI side is no better for this purpose. Nutraceuticals and health supplements sit under a regime that is unusual within the food world: the manufacturing facility needs a state or central licence, and then each product making a health claim needs its own approval. Products containing ingredients outside the permitted lists, and products carrying health or disease risk reduction claims, require explicit clearance before they can be sold. That means a substantiation dossier exists inside the regulator for a meaningful number of products. Those dossiers are not public. There is no published index of which claim was allowed on the strength of which study, and no way for a competitor, a journalist or a retailer to check whether the evidence cited on a pack is the evidence that was filed.

How many Indian nutraceutical brands hold human clinical data on their own finished product, as opposed to citing somebody else's ingredient study? Nobody knows. And the fact that nobody knows is the most revealing finding of all.

So the honest position is this. There is no dataset in India from which anyone can currently state, with defensible precision, what share of marketed nutraceutical SKUs are backed by a human clinical trial on the finished formulation. The industry's own trade bodies do not publish it. The regulator does

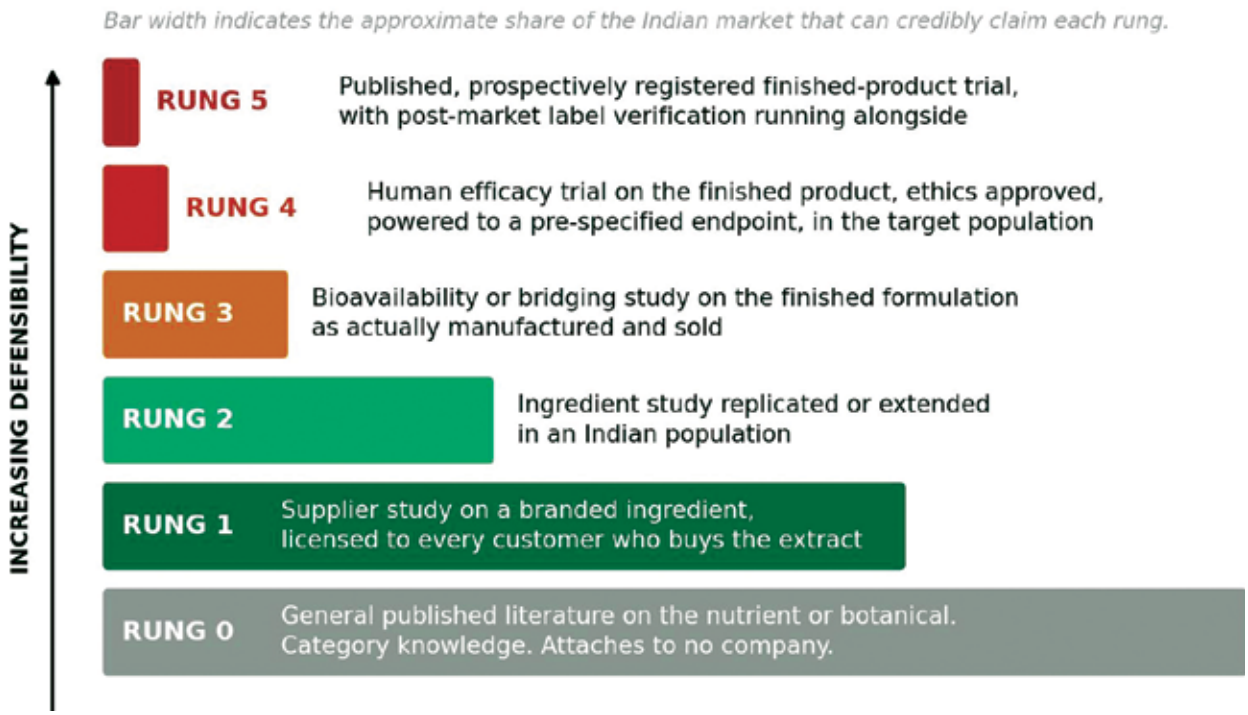


Figure 1. The six rungs of nutraceutical evidence. The overwhelming mass of the Indian market sits at rungs zero and one.

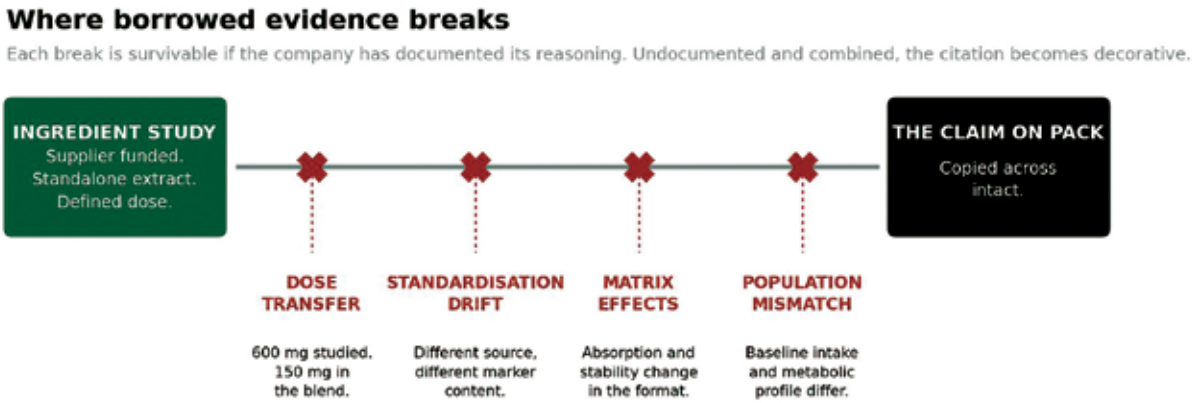


Figure 2. The four points at which an ingredient study stops describing the product on the shelf.

not publish it. Investors do not ask for it in a standard form during diligence.

That opacity is not neutral. It is the condition that lets borrowed evidence circulate as though it were owned evidence, because there is no cheap way to tell the two apart from outside the company.

The evidence ladder

If the market cannot be counted yet, it can at least be classified. Everything a nutraceutical brand in India might point to when asked to justify a claim fall into one of six rungs, and the distance between the rungs is far larger than most marketing departments acknowledge.

Talk to formulators, CROs and regulatory consultants working the Indian market and a consistent picture emerges. The overwhelming mass of the market sits at rungs zero and one. A visible minority of larger companies and export-oriented manufacturers operate at rung three. Rung four is a small population, concentrated in a handful of listed nutrition companies, ingredient houses that also sell finished goods, and a thin band of ambitious direct-to-consumer brands using clinical data as a marketing weapon. Rung five is measured in dozens of products, not thousands. The scale of the CRO market corroborates the shape. Nutraceutical CROs operating in India advertise portfolios that run to single-digit or low double-digit numbers of documented finished-product studies. One Delhi-based CRO lists five nutraceutical clinical studies in its public capability page, with participant counts of 76, 60, 24, 24 and 120. Those are the kind of numbers a specialist accumulates over years. Set them against a market generating thousands of new SKUs annually and the ratio speaks for itself.

Why the gap exists, and why it is rational

It would be easy, and wrong, to read this as an industry cutting corners out of indifference. The evidence gap is the predictable output of three structural forces, and each has to be dismantled separately.



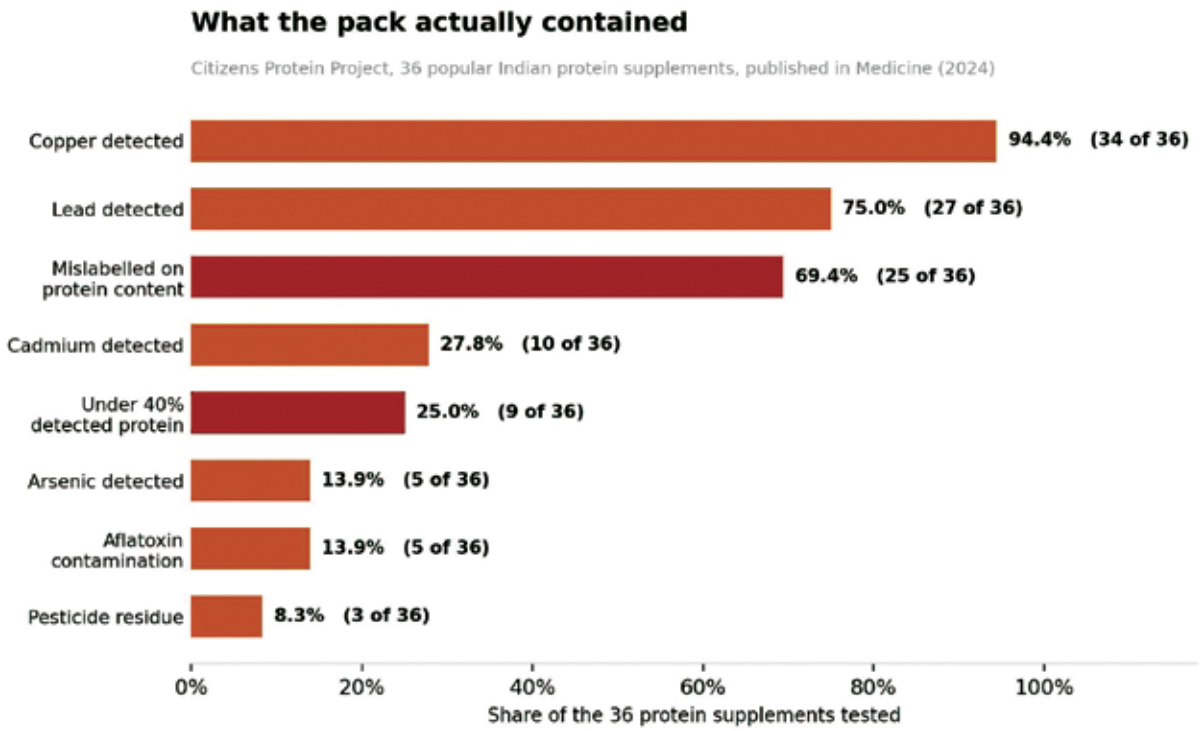


Figure 3. Findings across 36 popular Indian protein supplements. Red bars indicate label integrity failures, amber bars indicate contaminant detection.

One: the arithmetic

A properly powered human efficacy trial on a finished nutraceutical, run through an Indian CRO with ethics oversight and prospective registration, is a meaningful capital commitment before a single unit sells. It takes months to design, months to recruit, months to run and months to analyse and write up. Set that against the commercial reality of a category where a challenger brand may launch a SKU, scale it through quick commerce, and either kill it or reformulate it inside eighteen months. The trial finishes after the product it was studying has already been replaced.

Two: formulation churn

Nutraceutical portfolios in India are not stable. Flavours change, sweetener systems change under cost pressure and sugar-reduction pressure, actives get added because a competitor added them, doses move to hit a price point. Every one of those changes technically invalidates a finished-product study conducted on the earlier version. Companies know this, and it creates a perverse incentive: why generate product-specific evidence that a procurement decision six months from now will render obsolete? Borrowed ingredient evidence, by contrast, survives reformulation, because it was never about the product in the first place.

Three: the borrowed model is actively sold

Branded ingredient suppliers compete on the strength of their clinical dossiers. A supplier that has funded three randomised trials on its extract markets those trials to formulators as a reason to buy. The study is, functionally, part of the raw material package. From the brand's perspective, buying the ingredient is buying the evidence, and it costs nothing extra. This is not a scandal. It is a legitimate and globally standard commercial arrangement. The problem arises only at the last step, when the brand's communication quietly drops the qualifier and presents supplier science as house science.

Where borrowed evidence actually breaks

The transfer of an ingredient study to a finished product is not automatically invalid. It is a scientific argument, and it can be a good one. What matters is whether the brand has done the work to make the argument, or has simply assumed it. Four failure points recur.

Dose transfer is the most common break and the most trivially detectable: the ingredient trial used 600 mg of a standardised extract, the finished product carries 150 mg because the pack is a multi-ingredient blend competing on a price point, and the claim is copied

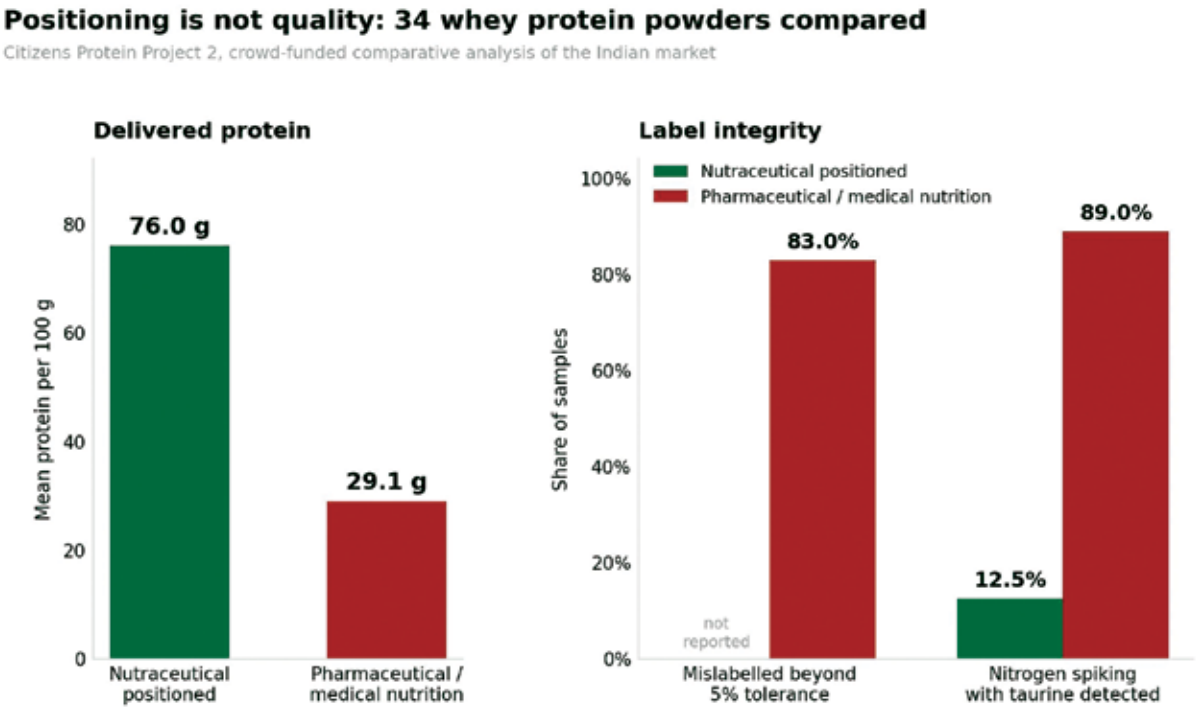


Figure 4. Positioning proved to be a poor proxy for quality. Products carrying clinical or medical framing performed worse on both delivered protein and label integrity.

across intact. Standardisation drift follows close behind, where the commercial formulation swaps in a cheaper extract from a different source with different marker content, or with no standardisation declared at all. The molecule name on both labels is identical. The material is not.

Matrix effects are the least discussed and the most consequential. An active studied as a standalone capsule behaves differently when suspended in a protein powder alongside fifteen other botanicals, cocoa solids, a sweetener system and an emulsifier. Absorption changes. Interactions occur. Stability over the shelf life of a powder in Indian humidity is not what it was in a foil-sealed clinical supply. A bridging bioavailability study answers this for a fraction of the cost of a full efficacy trial, and its absence is the most conspicuous gap in the average Indian evidence file. Population mismatch completes the set, and it is not a nationalist point but a methodological one: it is the same argument Indian pharma has made successfully for decades about the need for local bridging data.

The precondition nobody wants to discuss

There is a step that sits underneath the entire evidence discussion, and India has had it demonstrated in public in the most uncomfortable way possible: does the pack contain what it says?

In 2024, a self-funded observational analysis published in the journal Medicine, conducted by clinical researchers associated with Rajagiri Hospital in Kerala working with a technology entrepreneur, tested 36 popular protein supplements sold in the Indian market. It examined total protein content, aflatoxins, pesticide residue, heavy metals, steroids and full organic and inorganic profiling.

Twenty-five of the 36 products, just under 70 per cent, carried less protein per 100g than the label declared, with shortfalls ranging from under 10 per cent to more than half. Nine products delivered under 40 per cent detected protein content. Five samples showed aflatoxin contamination and three carried trace pesticides. Several products marketed as protein powders turned out to contain multi-herb blends, including ashwagandha and other botanicals, folded into the formulation.

A follow-up study, publicly crowd-funded and covering 34 whey protein powders, sharpened the picture by splitting the sample into products positioned as pharmaceutical or medical nutrition and products positioned as nutraceutical supplements. The result inverts the usual assumption about which end of the market is more rigorous.

The reason this matters for the evidence conversation is direct.

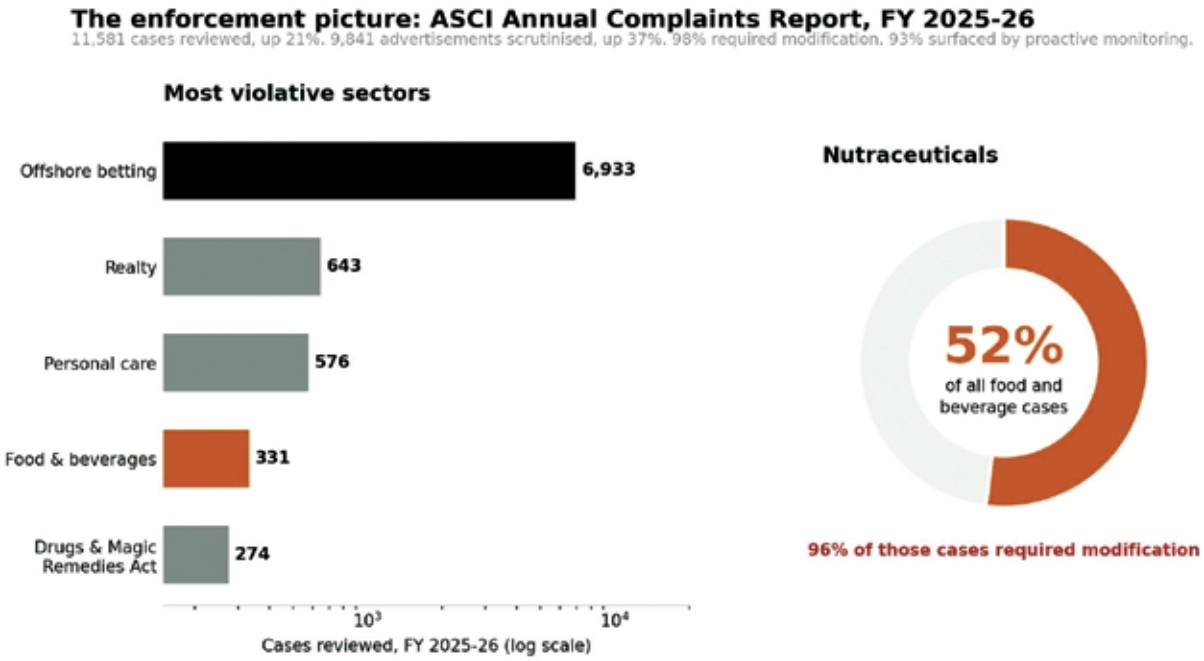


Figure 5. Food and beverages sits fourth by case volume, but nutraceuticals dominate the category and almost every case required a change.

Clinical substantiation assumes the consumer receives the dose that was studied. If the analytical content of the tub does not match the label, then every claim resting on that dose is void regardless of how good the underlying trial was. Label integrity is not a separate quality issue running parallel to the evidence issue. It is the foundation the evidence stands on, and in one of India's largest and most visible nutraceutical categories it has been shown to fail at scale.

The squeeze is already here

For most of the last decade a company could sit at rung zero indefinitely without consequence. That window is closing from four directions at once.

The advertising regulator has picked its target

The Advertising Standards Council of India's Annual Complaints Report for FY 2025-26 recorded 11,581 cases, a 21 per cent increase year on year, covering 9,841 advertisements, up 37 per cent. Ninety-eight per cent of the advertisements scrutinised required modification, and 93 per cent of cases came from ASCI's own proactive monitoring rather than consumer complaints. Within food and beverages, ASCI flagged unsubstantiated claims around metabolic health, chronic disease, fertility, child development and organ function. Nutraceuticals accounted for 52 per cent of all food and beverage cases, with 96 per cent requiring modification. The council's own framing is that the growth of the category is blurring the line between food and medicine.

The question is not whether the Indian nutraceutical industry can afford to build evidence infrastructure. It is how much longer it can afford to borrow.

Read that as an industry warning rather than a compliance statistic. When a majority of a category's advertising requires modification, the problem is not a few bad actors. It is a standard operating practice.

The claims regime has two tracks, and the industry often blurs them

Under the 2022 framework governing health supplements, nutraceuticals, foods for special dietary use, functional foods and novel foods, a nutritional or function claim generally requires substantiation and independent ethics committee oversight for any supporting human study. A disease risk reduction claim is a

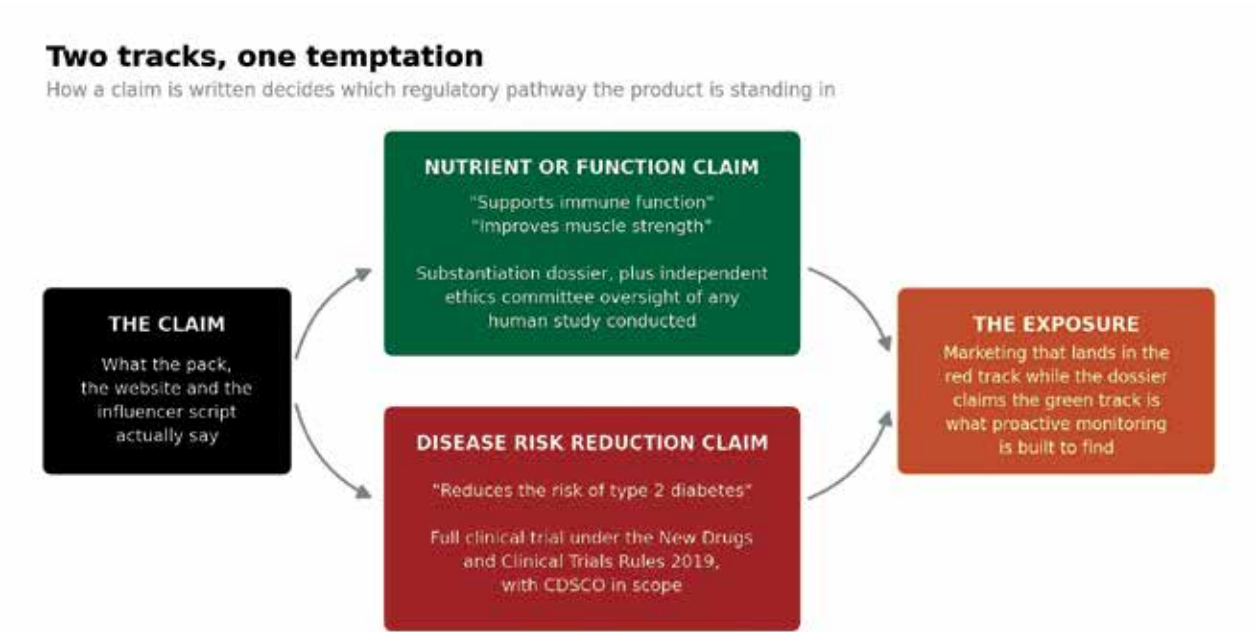


Figure 6. The wording of a claim, not the intention behind it, determines which regulatory pathway applies.

different animal entirely and pulls the product into a full clinical trial under the New Drugs and Clinical Trials Rules 2019, with CDSCO in the frame. The commercial temptation is to write copy that lands emotionally in disease risk reduction territory while claiming, on paper, to be a function claim. That gap between what the label technically says and what the influencer video actually communicates is precisely what proactive monitoring is now built to catch.

Front-of-pack labelling will change what a claim looks like

India's front-of-pack nutrition labelling debate has been running for close to four years. A parliamentary standing committee has recommended that FSSAI notify front-of-pack regulations, arguing that the delay has deprived consumers of interpretable information, particularly on sugar. The Supreme Court has pulled up the regulator over its failure to decide on warning labels for

COMPONENT	WHAT IT HAS TO CONTAIN
Analytical truth	Third-party verified certificates of analysis for the finished product as sold, covering declared actives, nutrient content, heavy metals, aflatoxins, pesticide residues and adulterants, on a defined batch sampling schedule rather than once at launch.
A written bridging rationale	A short document explaining how the cited ingredient evidence transfers to this formulation: dose comparison, standardisation comparison, matrix considerations, population considerations, and an honest statement of the limits of the transfer.
Finished-product bioavailability	The cheapest product-specific human data available, and the one that closes the most common gap between the study and the SKU.
A claims map	Every claim, in every channel including influencer scripts and quick-commerce descriptions, mapped to the evidence supporting it and to the regulatory track it sits in. Most companies find their marketing claims and their regulatory claims are not the same set.
A prospective trial plan	Not every product needs a trial. The one that carries the brand does. Register it before the first participant is enrolled.
Post-market verification	Periodic re-testing of market samples against label, treated as a governance control reported upward, not a task buried in quality control.

products high in sugar, salt and saturated fat. Whichever design eventually lands, whether a warning system or an interpretive rating, the effect on nutraceuticals is the same: a mandatory, standardised, government-designed signal will occupy the most valuable real estate on the pack, and voluntary brand claims will have to survive next to it. A benefit claim sitting alongside an unflattering official mark is a harder sell than a benefit claim sitting alone.

And the scientific establishment has taken a position

The revised Dietary Guidelines for Indians issued by ICMR-NIN in 2024 include a guideline explicitly discouraging protein supplements for muscle building, citing risks associated with prolonged high intake. Whatever one makes of the nuance, the practical consequence is that the country's most authoritative nutrition body has given every clinician, every journalist and every litigant a citable default position against a flagship category. The only counterargument that works against a national guideline is product-specific human data. Ingredient literature will not do it.

The export mirror

There is a commercial reason to fix this that has nothing to do with domestic enforcement. India's nutraceutical export ambition, whether in finished goods, private label manufacturing or botanical extracts, runs through buyers and regulators who ask for a dossier. European authorities interrogate claims against a defined framework. United States buyers and retailers, operating under a structure-function claim regime, increasingly demand certificates of analysis, third-party testing and substantiation files as a condition of shelf space. Gulf and ASEAN registrations ask their own questions.



What every one of those pathways has in common is that they ask about the product, not the ingredient. A dossier that opens with a supplier's extract study and never bridges to the finished formulation is an incomplete dossier, and the gap becomes visible immediately. This is the strongest argument available to anyone inside an Indian nutraceutical company trying to get evidence spend approved. Domestic compliance can be framed as a cost. Export readiness is unambiguously an asset, and the two are now built from exactly the same file.

What a defensible evidence file contains

For a company deciding what to build, the target is not a single trial. It is a file, assembled once and maintained.

Five questions worth asking in the boardroom

1. For our three largest SKUs by revenue, is there any human study conducted on the finished formulation as currently manufactured? Not on an ingredient in it. On it.
2. If a regulator, a journalist or a litigant asked us tomorrow to produce the substantiation file behind our best-known claim, how many days would it take, and who owns that file?
3. When did we last independently test a market-purchased sample of our own product against its declared label, and what did it show?
4. Has our formulation changed since the evidence we cite was generated? If yes, what document records why the evidence still applies?
5. Of our marketing budget for the coming year, what percentage is going into generating evidence we would own, versus amplifying evidence we borrowed?

The last question is the one that reframes everything. The Indian nutraceutical industry has spent a decade treating clinical evidence as a regulatory cost centre, a compliance tax paid reluctantly and as late as possible. That framing was defensible when nobody was checking. It is now actively expensive, because the alternative to owning evidence is not saving money. It is carrying an unquantified liability against your largest revenue lines while your export ambitions stall at the dossier stage.

Evidence is an asset. It is defensible, it is durable across the life of a formulation, it is the only thing that survives contact with a national dietary guideline pointed at your category, and it is transferable in a transaction. When consolidation arrives in this market, and it will, the companies holding finished-product human data will be the acquirers. The companies holding a folder of supplier PDFs will be the assets. NS

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How the FSS Act Changed India's Food Industry

Few pieces of legislation have reshaped an industry as fundamentally as the Food Safety and Standards Act, 2006. Over two decades, the FSS Act has moved food safety from a fragmented regulatory requirement to a core business function—changing how companies manufacture, source, test, package, label and market food. It has formalised millions of food businesses, established common standards, strengthened scientific testing and made food safety an operational and reputational priority.

When the Act was enacted in August 2006, India's food industry operated under multiple laws, standards and enforcement mechanisms. The creation of the Food Safety and Standards Authority of India (FSSAI) brought these into an integrated, science-based framework, creating a common regulatory language and clearer expectations around safety, quality and compliance. This has been particularly important as India's food processing sector has expanded, attracting greater investment and connecting domestic businesses to increasingly demanding national and global markets.

One of the Act's most significant impacts has been the formalisation of India's food-business ecosystem. Licensing and registration have brought manufacturers, processors, importers, distributors, retailers, restaurants, caterers and small food businesses into the formal regulatory system. By June 2026, more than 74.33 lakh active food business licences and registrations were recorded, demonstrating the scale of India's regulated food economy.

Formalisation has also changed corporate behaviour. Food safety is increasingly treated as an operational responsibility rather than something addressed only during regulatory inspections. Businesses have invested in quality control, supplier management, hygiene, documentation, traceability and preventive systems. Good Manufacturing Practices, Good Hygiene Practices and HACCP-based systems have consequently gained greater importance. For organised food companies, stronger compliance has also become a prerequisite for building brands, entering modern retail and meeting the requirements of international customers.

The Act has strengthened the shift towards science-based and risk-based regulation. Between 2022–23 and 2024–25, more than 5.18 lakh food samples were analysed, while over 56,000 risk-based inspections were conducted. This growing emphasis on testing and surveillance has encouraged businesses to focus on prevention and evidence-based compliance.

India's testing infrastructure has expanded alongside this shift. By 2026, the country had 259 NABL-accredited food-testing laboratories and 24 referral laboratories. In addition, 47 State food-testing laboratories had been structurally upgraded and 34 specialised microbiology laboratories established. 305 Food Safety on Wheels mobile laboratories were operating across 35 States and Union Territories, extending testing closer to businesses and consumers.

Digitalisation has further transformed industry-regulator interaction. FoSCoS has moved licensing and registration processes online, improving accessibility and transparency while creating a more structured regulatory database. This digital shift is also laying the groundwork for more data-driven regulation and faster compliance processes.

The Act has also helped build a professional food-safety ecosystem. More than 30 lakh food handlers have been trained through over 80,000 training programmes, supporting the growth of Food Safety Supervisors, auditors, laboratory professionals and consultants.

The deeper impact is cultural. Food safety is increasingly shifting from "How do we comply?" to "How do we build safety into the product from the beginning?" As India's food industry expands into processed foods, nutraceuticals, functional foods, novel foods and new technologies, safety will increasingly influence brand reputation, market access and consumer trust.

Twenty years after the FSS Act, India's food industry is more formal, digital, science-driven and accountable. Its next challenge is to make food safety not merely a regulatory obligation, but a business imperative and competitive advantage. NS

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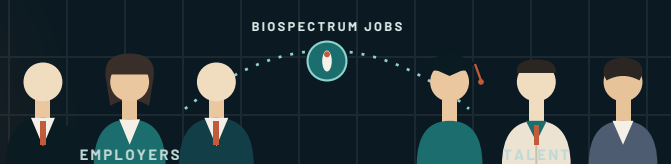
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of APAC employers report difficulty filling roles
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of sites can't hire process-development staff
BioPlan Associates, 2026

44%
estimated job-readiness of pharma graduates
Industry assessment, 2026

72%
of pharmacovigilance teams are understaffed
Drug Safety Alliance



INSIDE THE REPORT

- The barbell market & the hollow middle
- Five roles employers can't fill
- Why the pipeline fails — the leaky funnel
- The APAC cluster map
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