Section 5: Coordination, Partnerships and Emerging Issues

20. Coordination and Partnerships
Chapter 20: Coordination and Partnerships

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Chapter 20: Coordination and Partnerships

In order to achieve the end goal of any programme, a network of partnerships is required. A forum together with leaders and champions from government, businesses, civil society and the community can help bring together the vision of a programme. Let us learn about how coordination and partnerships are achieved.

Eat Right India movement is one such programme that requires convergent action in order to translate unified, concrete actions to show results.

Coordination between Government Programs and Schemes

As per the Food Safety and Standards Act, 2006, it is expedient in the public interest that the Union should take under its control the food industry. This clause enables the Union to legislate on the subject matter in the public interest.

Taking the case of Eat Right India Movement, it requires multiple interventions targeting all parts of food value chain that span all levels of governance and include representation from a wide range of stakeholders. Designing a robust food system, thus, requires partnered approach with a coordinated action plan. Given that mandates of most of the ministries/departments relate to food in one way or another, ‘whole of government approach’ is necessary. We must also be able to leverage synergies with various ongoing flagship programmes that directly or indirectly relate to food.

Convergence is the key for multi-sectoral programmes. The issues pertaining to food and nutrition, safety and hygiene are connected and require synergistic action involving all the major programmes in India.

Case Study: Eat Right India

FSSAI has launched ‘The Eat Right India’ movement to bring about social and behavioural change in diets whether people eat at home, at school, at workplace or when they eat out so as to prevent death and disease from unhealthy diets.

If Eat Right India has to scale up and sustain, consumer awareness and educational activities should be aligned and converged with established government programmes. Relevant programmes include the National Health Mission with renewed focus on wellness under ‘Ayushman Bharat’; School Health Program; Integrated Child Development Services scheme for children under 6 years of age and their mothers; Mid-Day Meal (MDM) scheme for school children and Anaemia-Mukt Bharat.

For reaching the community through the grass-root functionaries an Eat Right Toolkit and online video courses on Food Safety and Nutrition have been developed for the frontline workers namely ANMs (Auxiliary Nurse Midwives), ASHAs (Accredited Social Health Activists), Anganwadi workers (supervisors for child care centres) and mid-day meal
supervisors. The toolkit is an interactive training module with a manual for training frontline health workers on key messages of eating safe, eating healthy and eating sustainably. This toolkit is being integrated with health and wellness centres under ‘Ayushman Bharat’ to reach people at the grassroots level. An online course for frontline health workers has also been developed.

In addition, short and structured e-courses on food science and nutrition have also been developed for students, professionals and the general population to enhance their knowledge for professional and personal development. These courses include demonstrative and interesting training modules on various topics on food and nutrition at the basic and advanced levels. Participants can register online, take the courses at their own pace online and get themselves evaluated also online. This system allows these courses to be disseminated to a wide audience, quickly and conveniently.

Through 220,000 ANMs, 870,000 ASHAs workers under the Ministry of Health and Family Welfare and 12,93,000 Anganwadi Workers under the Ministry of Women and Child Development, very extensive reach of eat right messaging across the country is possible. Frontline workers can be trained to spread the Eat Right message for community education and outreach.

The Eat Right India movement is based on three pillars which align well with the various programs of Government of India. It envisages resolving various health issues with collaborative efforts from various stakeholders. For instance, special cleanliness drives in fruit and vegetable markets, street food vending areas in cities/towns could be jointly taken up under the Swachh Bharat Abhiyan. With Ayushman Bharat, as a part of preventive and promotive healthcare strategy, frontline health workers in the health and wellness centres could be trained on food safety and nutrition. The ‘Eat Right Toolkit’ and online courses would help empower the frontline workforce and able them to bring about change in the community. This could also be used for training of Anganwadi Workers under Poshan Abhiyan and complement their own training efforts. Promotion of fortified staples in safety-net programmes like ICDS, MDM and PDS is already part of stated policy of the government. This could be accelerated under Eat Right India. Together with Anaemia Mukt Bharat and the Poshan Abhiyaan, micronutrient malnutrition which is one of the major causes of lowered productivity can be addressed and rectified.

Jal Shakti Abhiyaan could have special focus on potable water supply in clusters of petty food vendors in places such as street food hubs, vegetable, fruit, meat markets. Recognizing these synergies and enabling cross-departmental collaboration would ensure a coherent approach to the food system.

The Eat Right India movement simplifies the fundamental truth, that safe and healthy food is at the heart of preventive and promotive healthcare. In order to create a sustainable culture and build trust the expected outcome is to promote personal responsibility of choosing the ‘right foods’.

In accordance to the philosophy of Gandhiji, community mobilization will help create local champions to take the movement forward. Empowering consumers to make the right choices and building their capacity will help strengthen systems to promote, propagate and sustain the culture of healthy living.
At the State/District level, the already established State Level Advisory Committees in association with various departments and local experts can alter the nutrition landscape of the States and progress towards a healthier India. This would also help evolve from the traditional governance to a more inclusive partnership at the State level.

With the growing concern of various public health ailments, the industry support towards accessible healthy choices in foods will also help empower and benefit both the businesses and the consumers.

Further, a strengthened partnership will build a strong network and associations to achieve global goals of health, safety and nutrition which will assist the economic growth of the country.

**Private sector participation**

Private sector comprises of big or small enterprises, companies, businesses from all sectors, include a defined supply chain and have resources that can be explored. The private sector participation is critical to execution of a programme where they play a key role as a stakeholder. To fast-track the programme and get funding which may be limited as per the government budget, the involvement of the private sector is essential. A healthy competition between the stakeholders is also needed to create a positive culture.

In the current times, the policy makers and analysts in various developing countries are seeing value in engagement with the private sector. The governments alone often cannot bear the cost of the growing demands of the public through its various programmes, thereby making the private sector a key stakeholder and inclusion as partners in implementation of programmes.

Delivering on the outcomes of any policy, requirement of partnerships is essential. The success of a programme can be achieved through the Public-Private Partnership models which can accelerate the developmental environment. The two models that drive the private-public sector engagement are the transactional or the transformational models as displayed in Figure 1. The transactional models involve commercial or philanthropic aspects of the coordination. The partners interaction is solely based on an exchange and fulfilment of individual needs. The learning move from the transactional to the transformation model is the basis of the public-private sector coordination. This may involve collaboration in terms of resources, skills and capabilities. Leveraging on the core competencies of each other aid in joint decision making, increased learning, and a sustained impact.
Factors driving Private Sector Partnerships are:

- **Societal**: Public agencies have been unable to satisfy basic water needs for all. The context is one of dwindling public funds, increased demand, large investment gaps, ageing infrastructure in need of rehabilitation, and calls for increased decentralisation.

- **Commercial**: The Dublin Water Conference in 1992 established water as an “economic good”. This challenged the traditional approach to water service provision, which held that water services were the domain of public agencies alone.

- **Financial**: There is a belief that the private sector can mobilise capital faster and cheaper than the public sector. The expectation that by shifting assets from public control into private ownership and capital markets, economic efficiencies can be unleashed.

- **Ideological**: This refers to the notion that “smaller government is better”.

- **Pragmatic**: Inability of governments to finance increasing capital, operation and maintenance costs of municipal water systems. Need to invest in infrastructure, increasing population, and constrained public finances.
**Avenues of Collaboration**

The engagement with the private sector is mutually beneficial. It increases opportunity for the private sector to be a part of policy decisions that affect them. The contributions that may be expected from the private sector can be in the form of financial or non-financial.

1. *Knowledge Dissemination* - One of the areas is involving the private sector to support the vision of the government priorities. Areas of mutual collaboration can be identified. The collaboration can also involve knowledge exchange which will help strengthen the areas of engagement.

2. *Corporate Social Responsibility* – Financial assistance towards a cause that is undertaken by the private sector may form linkages with specific government programs. The CSR can be targeted towards identified projects.

3. *Resource Mobilization* – The apt utilization of human, financial and other resources is fundamental to any programme. The private sector entities have access to better resources and may aid in specific activities. They can provide for expertise, funds, manpower and technical support. Through their network and operations, they can also assist in resource mobilization at the community level.

4. *Technical Expertise* – The private sector often harbours great minds and technical expertise; these can be utilized to work regionally as well as across the country. The companies can support the vision, build capacity, provide innovative technical support that can help Eat Right India to work in convergence with various sectors. The role can be identified in various areas.

5. *Policy advocacy and Communication* – The engagement and viewpoint in dialogue related to food and nutrition security can assist in building better policies. Inculcating the sense of ownership in the private sector will also help provide an element of sustainability. Focussed and targeted communication and advocacy can thus happen in a structured, organized and unified manner.

**Case Study: CHIFFS/ FACE/ ReCHaN**

1. FSSAI has joined hands with CHIFFS (CII-HUL Initiative on Food Safety Sciences) with the purpose of driving activities related to science based food safety in the country, to strengthen protection of consumers and create an innovative environment for the industry.

2. The CII Jubilant Bhartia Food and Agriculture Centre of Excellence (CII-FACE) is charged with the mission to improve the competitiveness of India’s agriculture and food processing sector, by catalysing innovation, building capacity and enhancing productivity across the agriculture and food value chain, ensuring food security and inclusive growth. FACE works closely with farmers, companies, developmental institutions, and the government.

3. ReCHaN is a collaborative initiative of FSSAI, IADSA and CII to foster a culture of best practices in the area of Manufacturing and Standards formulation of Health Supplements and Nutraceuticals.
**Key steps in Public-Private Partnerships**

Global Partnership for Results-Based Approaches has outlined the key steps to be followed for partnerships (Figure 2). The steps below highlight the critical phases which must be undertaken in a step-wise manner to implement a PPP project. The steps must always keep in perspective the needs of all stakeholders involved.

![Diagram of key steps in PPP process]

*Figure 20.2: Key Steps in forming Public Private Partnerships*
Science and research

Section 16.3(e) of the Food Safety and Standards Act, 2006 requires FSSAI to establish a system of network of organizations with the aim to facilitate a scientific co-operation framework by the co-ordination of activities, the exchange of information, the development and implementation of joint projects, the exchange of expertise and best practices in the fields within the Food Authority’s responsibility.

In this context, FSSAI has established a nationwide network for scientific research with an intent of ensuring a convergence of research activities in the area of foods safety and applied nutrition, sharing information on developments in the field of food testing methodologies and techniques for strengthening quality of food testing, generating/sharing of scientific data and information related to food safety and applied nutrition and utilizes such scientific data for development of food standards, both at national and international level, and in other risk management decisions and creating centres of excellence having different focus and expertise which will provide research and training that addresses timely, cutting-edge issues related to food safety and applied nutrition.

FSSAI has notified many technical standards and regulations. Robust institutional mechanism is now in place to set standards through 21 scientific panels and a scientific committee. There are nine technical panels that formulate guidance documents, code of practices and inspection metrics. Further, eight Standards Review panels have been set up to review food standards and provide inputs to the related scientific panel. FSSAI has also notified regulations for standards on health supplements, nutraceuticals, prebiotics and probiotic products, which are primarily intended for sustenance of a healthy life and fall in the category of functional foods.

Higher education and learning

As industry and service sectors continue to dominate the economy, the need for skilled manpower of approximately 250 million is expected by 2030, a major source of which could be the Higher Education System. With a population of an average age of 32 years, India has a high potential to become one of the largest suppliers of skilled manpower to global markets. However, only 8.11% employers believe that job seekers possess skills that align with industry requirements.

Currently, 79% of the organisations offer formal training to their employees. An industry-ready workforce will lead to a reduction in on-job training time for organisations leading to higher productivity, sustainable growth and food safety implementation.

In India, nutrition courses are offered by various universities at graduate and post-graduate levels through both regular and distance learning. However, there is still some vacuum that exists in the online space. There are professionals and students who intend to enter the field of nutrition with knowledge and skills on latest advances in research and industry. Therefore, in this era of digitization, the Food Safety and Standards Authority of India (FSSAI) intends to harness the power of the internet and offer online courses which are intended to train students and help professionals update their knowledge and skills specifically in the area of nutrition at their own pace.
Engaging with Higher Education Institutes on strengthening Capacity on Food Safety and Nutrition will impact several stakeholders. Through its Higher Education Outreach programme, FSSAI is trying to inculcate the concept of Eat Right India into the course curriculum for it to strengthen the food and nutrition content taught to the children. These are the Organisation itself, Faculty members, Students of Colleges and Schools, Industry, Government and ultimately the consumers of food. This will help Institutes with the added opportunities of offering and engaging with a bouquet of contemporary learning and skilling modules that will ultimately help enhance the employability and skills of the students of the implementing Institutes in alignment with the current industry requirements. Content can be mainstreamed either as part of the overall curriculum or offered as certificate courses. This is supported by relevant curricular plan, content, plus faculty development programs.

Case Study: Mainstreaming content on Eat Right

In its journey of moving from the narrow focus on adulteration to a more holistic approach of safe and wholesome food and to empower responsible citizens to Eat Right; FSSAI relies on a collaborative approach. The FSS Act 2006 in its statement and intent makes it clear that all stakeholders, be it the Regulatory Body, the Food Business Operators (FBOs), or the citizens of the country, have to be active agents and ensure they play their part in ensuring safe and wholesome food. Yet, any law is as good as its implementation, as real action or change is driven not by a thought alone, but by action and by taking responsibility. Food Safety cannot be viewed merely as a program or scheme, it has to be a culture and a habit, and Higher Education Institutes need to play a prominent role in this context.

FoSTaC is FSSAI’s Food Safety Training & Certification Program for Food Safety Supervisors across food sectors. Practical, industry-oriented training modules have been developed by FSSAI in collaboration with industry, domain experts and National Resource Persons and disseminated through various FoSTaC courses which are of Basic, Advanced and Special Level. The objective is for all licensed food businesses to have at least one trained and certified Food Safety Supervisor (FSS) under FoSTaC for every 25 food handlers in each premise. Academic Institutes may therefore integrate the FoSTaC curriculum as separate modules in their curriculum, or offer it as standalone certificate courses to their students and/or the food business community. Persons successfully trained and assessed under FoSTaC would be jointly certified by FSSAI and the Training Partner.

Practical Learning

1. Internship at FSSAI - FSSAI, in its mission to disseminate Food Safety awareness in the country, offers a basket of opportunities to develop and refine the skills of young talent. Internship scheme is one of these initiatives which is offered to students through a mutually beneficial inter-Industry-Academia association. Some of the project areas include, Regulations/Codex, Standards, FSMS, Quality Assurance, Risk Assessment and social and behavioural change.
2. **Support in Dissertation** - Through this scheme FSSAI provides real-time mentoring of students and provides them an opportunity to complete their research. The scheme gives a real-world exposure to policy making, regulatory and enforcement systems, and standard setting to the students.

3. **Fellowship in Food Analysis** - FSSAI has initiated a program called “Fellowship in Food Analysis (FIFA)” to incentivise the Junior Analyst Examination (JAE) qualified candidates to fulfil the relevant experience criteria for eligibility as a food analyst, through attachment at an FBO’s laboratory/testing laboratory. FIFA is a paid fellowship for a period of 3 years, after which the Fellows will be eligible for taking the Food Analyst Examination (FAE).

**Interactive learning**

**Eat Right Quiz** - The Eat Right Quiz, designed on Amazon Alexa platform, aims to enhance the knowledge of citizens, about the basics of food safety and nutrition, and thus removing myths related to them, in a simple playful manner. Eat Right Quiz aims to engage and encourage citizens to learn about safe, healthy and sustainable food through entertainment and competition. The Eat Right Quiz consists of questions, which are collated by the eminent experts of the food industry. The quiz can be played between individuals or between teams. The quiz consists two levels; basic and advance in four categories. The unique feature of this quiz is that after every right answer the device also gives brief information related to the answer.

**SNF Fellowships** - The Eat Right @School initiative of FSSAI has been designed to deliver and reinforce the message of safe and nutritious food to schoolchildren, through both curricular and co-curricular activities. Additionally, it aims at ensuring and enabling legislative and regulatory framework to promote safe and wholesome food in both government and private schools across the country. SNF Fellowship programme is designed for the implementation by students of Higher Education Institutes, for promoting social and behavioural change around food safety, hygiene, and healthy diets in school children.

**Promoting entrepreneurship - Food Innovators Network (FINE)**

This brings together entrepreneurs who provide innovative solutions to transform the country’s food safety and nutrition landscape. It is a comprehensive entrepreneurship platform that engages with start-ups working in the food space and provides mentorship, network access and regulatory support to them. It focuses on four challenge areas namely, Cheaper, Rapid and Anywhere Food Testing, Ensuring Availability of Healthy Foods, Educating India and Rethinking Food Labelling and Recovery of Surplus Food. It includes a FoSTaC Plus training course to orient start-ups, a FSSAI Buddy Programme to navigate the regulatory space and Eat Right Start-Up Awards as incentives and rewards to encourage innovative entrepreneurs.
Participation and role of professionals

Involving all stakeholders often helps achieve the targets. We associate with experts to capture skillsets, resources and offerings. That’s how value is created in an initiative. Professionals engage frequently in formal and informal conversations. Collaboration with professionals can encompass a wide range of activities with possible and innovative solutions to existing problems. Collaborative discussions with the partners focus on actions which relate to the goals of the programme.

Case Study: Network of Professionals (NetProFaN)

FSSAI has created the NetProFaN which aims to form a network of professionals in food and nutrition, leveraging their strength and expertise, to support both demand and supply side initiatives of Eat Right India. The programme has envisioned collaboration of professional bodies and experts in the areas of food, nutrition and public health, to contribute towards national efforts for improving the status of food safety and nutrition. This will help growth of the associations and professionals and expand its outreach. The knowledge of these experts will assist in supporting Eat Right India. Their engagement with the higher education will help build capacity. This will in turn create a culture of safe and healthy food thereby bringing in the desired social and behaviour change. NetProFaN brings various Professional Associations to work together for a healthy future:

- Indian Dietetic Association (IDA)
- Nutrition Society of India (NSI)
- Indian Medical Association (IMA)
- Association of Food Scientists and Technologists of India (AFSTI)
- Indian Federation of Culinary Associations (IFCA)
- Association of Analytical Chemists, India Chapter (AOAC)
- Indian Public Health Association (IPHA)

Global partnerships

Engagement and collaboration with global agencies and countries provide a unique and multi-sectoral platform to deliver results across all sectors. The global exchange through such interactions ensures that learnings are effectively taken up and integrated within the existing systems via practical guidance.
Case Study: The Busan Partnership

This document specifically highlights a set of common principles for all development actors that are key to making development cooperation effective. They key focus areas are:

- Ownership of development priorities by developing counties: Countries should define the development model that they want to implement.
- A focus on results: Having a sustainable impact should be the driving force behind investments and efforts in development policy making.
- Partnerships for development: Development depends on the participation of all actors, and recognises the diversity and complementarity of their functions.
- Transparency and shared responsibility: Development co-operation must be transparent and accountable to all citizens.
- These principles are recognised and accepted by all those involved in development co-operation, from donor and recipient country governments to providers of south–south cooperation, international organisations, civil society, parliamentarians and local government. The wide participation of a range of actors with differentiated responsibilities and shared goals is one of the notable characteristics of this partnership.

Global partnerships help achieve two main objectives. First is to evaluate the efficiency of governments in creating an enabling environment to attain the potential efforts of policy and community mobilization within the country. The second is to observe how the development partners extend their support to the national programs and policies. This involves inclusive partnerships that is result oriented. The partnership must be transparent and should bring accountability to all stakeholders involved.

Organisations responsible for food safety and nutrition

There are several organisations across the globe which work in the area of food safety and nutrition. Let us learn about these and see how they can collaborate and partner to create a better food safety and security scenario in the world.

1. **FSSAI** – FSSAI lays down science-based standards for articles of food and regulates their manufacture, storage, distribution, sale and import to ensure availability of safe and wholesome food to 130 crore citizens of the country. The authority is also responsible for creating an information network across the country so that the public, consumers, etc receive rapid, reliable and accurate information about food safety and hygiene and related issues of concern.

2. **Codex Alimentarius Commission** – It is a joint inter-governmental body of the Food and Agricultural Organization of the United Nations (FAO) and WHO with 189 members (188 member countries and one Member Organization (EU)). Codex has worked since 1963 to create harmonized international food standards to protect
the health of consumers and ensure fair trade practices. India is a member of Codex Alimentarius Commission since 1964 and continues to be a partner in the international food standards development process. India actively participates in the Codex meetings, hosting and co-hosting Codex Committee meetings.

3. **EFSA** - EFSA is a European agency funded by the European Union that operates independently of the European legislative and executive institutions (Commission, Council, and Parliament) and EU Member States. It was set up in 2002 following a series of food crises in the late 1990s to be a source of scientific advice and communication on risks associated with the food chain. The agency was legally established by the EU under the General Food Law - Regulation 178/2002. The General Food Law created a European food safety system in which responsibility for risk assessment (science) and for risk management (policy) are kept separate. EFSA is responsible for the former area, and also has a duty to communicate its scientific findings to the public.

4. **FSANZ** - FSANZ’s purpose is to contribute to the cooperative food regulatory system by developing evidence-based standards, providing evidence-based advice, coordinating regulatory responses and providing information about food standards. FSANZ is established by the *Food Standards Australia New Zealand Act 1991*, which was enacted to implement an intergovernmental Agreement between the Australian Government and all states and territories and a treaty agreement between Australia and New Zealand. The object of the *Food Standards Australia New Zealand Act* is to ensure a high standard of public health protection throughout Australia and New Zealand and the objective of FSANZ is a safe food supply and well-informed consumers.

5. **International and National Non-Government Organizations**: Organizations like WHO, UNICEF, WFP, etc. play a very important role in achieving goals as declared in the Universal Declaration of Human Rights “Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food, clothing, housing, and medical care and necessary social services, and the right to security in the event of unemployment, sickness, disability, widowhood, old age, or other lack of livelihood in circumstances beyond his control.” (Article 25).

   i. These organizations work towards global health and its issues which transcend national borders and political jurisdictions. Many of these organizations take active part in health projects both nationally and internationally. The various programs and competencies of these organizations contribute to the promotive or preventive health care (figure 3).
Support of these agencies can also assist policy framework or strengthen the existing policies. One of the major areas where these agencies can contribute is capacity building at the grass-root level. This will ensure that implementation of a policy or a program is flawless.

**International Agreements**

There are Treaties and Agreements between nations to ensure fair trade practices and at the same time ensure that member nations can protect the rights and ensure welfare of their citizens. These have been listed here:

1. *World Trade Organization (WTO)* – Established in 1995, WTO is the successor of General Agreement on Tariffs and Trade (GATT) established during the Second World War. The WTO rules are the results of agreements between its members. Through this agreement, WTO members can operate a non-discriminatory trading system that spells out their rights. Fair trade practices are ensured for both import and exports in the market. WTO is an umbrella agreement that is also used for dispute settling in trade.

2. *TBT & SPS* - The Technical Barriers to Trade (TBT) and Sanitary and Phytosanitary Measures (SPS) are agreements as a result of the Uruguay Round of Trade Talks following the WTO in 1995. The SPS agreements encompasses protection of
human or animal health from any food-borne illness, or human, animal or plant carried diseases from pests etc. The TBT agreement undertakes all technical regulations, voluntary standards and conformity assessment procedures to ensure adherence and ease of business.

In this chapter you have learnt about how different government as well as non-government agencies are co-ordinating and forging partnerships to ensure a scenario of safe food across the globe.

**Summary**

1. Partnerships and coordination are essential for effective implementation of a programme.

2. Collaboration with the private sector is needed to lend support and enhance visibility of a programme.

3. There are various avenues of collaboration that can be explored basis the needs of a programme.

4. FSSAI is the apex food regulator which is responsible for the creation of scientifically backed standards and regulations for various food products.

5. The Eat Right India is an umbrella movement initiated by FSSAI which focusses on the Social and Behavioural Change aspects to better the nutrition status of people.

6. Ensuring that information of food safety, health and nutrition is integrated in the higher education system of India is essential to developing a skilled workforce in the country.

7. Formulation of Global Partnerships ensure that the program meets global benchmarks and instils learning.

**Key Words**

**Convergence** – moving towards a union or uniformity

**Collaboration** – the action of working with someone for a common goal

**Partnership** – an association of two or more people or bodies as partners
Exercises

1. What is the role of Public-Private Partnerships and how does it strengthen programme implementation and sustainability?

2. What are the key steps in PPP models and which steps are a must for QA/QC?

3. Briefly describe the organizations working for food safety and nutrition?

4. What do you mean by interactive learning, highlight by giving some examples?

5. Briefly describe how a PPP model can support expansion of an FSSAI initiative.

References


6. WTO. World Trade Organisation. Website: https://www.wto.org/english/thewto_e/whatis_e/inbrief_e/inbr_e.htm
Chapter 21: New Trends in the Food Sector and Emerging Safety Issues

- Emergence of new hazards
  - Microbial hazards
  - Chemical hazards

- Trends in Consumption
  - Fad diets
  - Understanding Superfoods

- Using technology to tackle challenges
  - Food processing
  - Food packaging
  - Food transport and storage
  - Food safety testing

- Future of food
  - Nutrigenomics
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  - Gastronomic tourism

- Fake news and role of media
  - Hazard of fake news
  - Responsibility of media
Chapter 21: New Trends in the Food Sector and Emerging Safety Issues

The food ecosystem is constantly changing. Challenges like climate change, globalization of food industry, urbanization, emerging water- and food-borne diseases, antimicrobial-resistant bacteria, chemical contaminants in a greater number and variety of foods, increasing food costs, complexity of food supply chains, triple burden of malnutrition, changing food consumption pattern of consumers, etc. threaten food security and safety. New technologies and innovations are needed to address these challenges. Increasing food production, improving packaging, storage and transport to decrease food losses, newer methods of detection of contaminants and monitoring microbial growth, science-based methods of assessing risk and development of resource-efficient technologies are some of the ways of ensuring safe and wholesome food for the coming generations. This chapter discusses these trends as well as looks at emerging trends of fad diets and superfoods as well as sciences of nutrigenomics and molecular gastronomy. Technological advances in tools for communication have created the problems of 'information overload' and misinformation in the media. Let us see how the consumers can benefit from the advancements in technology as well as protect themselves from negative impacts.

Emergence of New Hazards

Technology is one of the driving forces of innovation today and it is challenging some of the most established companies to adopt to the new changes so that they stay relevant. The world is facing the challenge of population growth with an expected 10 billion mouths to feed by 2050. While use of biotechnology can increase the food supply, innovative solutions are needed for improving processing and packaging to increase shelf life and safety of food. Emerging new threats/hazards demand constant monitoring of the food supply with early identification systems. According to EFSA, an emerging risk is defined as “A risk resulting from a newly identified hazard to which a significant exposure may occur, or from an unexpected new or increased significant exposure and/or susceptibility to a known hazard.” New biological or chemical hazards, which were not considered problematic earlier, are being detected in foods which earlier didn’t have these hazards. In addition, hazards are causing illness in a greater number of people or in regions where they didn’t exist earlier. These hazards have to be recognized and controlled before they become major threats.

Changes in the food consumption behaviour with expansion of commercial food services, new methods of large-scale food production, processing and preservation, and, environmental pollution have led to the emergence of newer food safety issues. Advances in food science and biotechnology have introduced new food products, crop varieties and genetically modified foods. With global treaties and lifting of trade barriers between nations there is a greater movement of food from one country to another. While this trend maybe welcome from the point of view of better trade and accessibility to diverse foods, it also raises concerns about introduction of pathogens in countries which were hitherto unexposed to them as well as emergence of allergies due to consumption of new foods, and other adverse effects.
Other hazards which are emerging world-wide are virulent new strains of microbes which do not respond to the standard treating protocol. Emergence of drug resistant strains of microbes is being blamed on indiscriminate use of medication both in veterinary practice and by humans. The microbes learn to adapt and undergo mutations which make them stronger and more resistant. Microbes are also being detected in foods which were earlier not believed to be carriers of pathogens. Let us learn about some of these emerging hazards in greater detail.

**Microbial hazards**

Emerging pathogens of concern are those pathogens which are either causing a new illness or the number of cases is now increasing sharply, or they are spreading the disease over a wider geographical area. For instance, increasing number of people are falling ill due to Listeria, *E. coli O157:H7* and multidrug resistant strains of Salmonella, Brucella, etc. Bird flu, Swine flu, Coronavirus and other infections have been making an appearance adversely affecting the food industry.

*Escherichia coli O157:H7* which causes diarrhea and hemolytic uremic syndrome, was earlier found in undercooked ground beef. It is now being detected in other foods like raw milk, apple cider, lettuce, brussel sprouts, uncooked sprouts, and soft cheeses made from raw milk. Listeriosis, caused by eating food contaminated with the bacterium *Listeria monocytogenes*, affects primarily pregnant women, newborns, and adults with weakened immune systems. It has been detected in foods like milk, soft cheeses, salads, processed meats and ready to eat chicken and meat preparations which are contaminated post cooking. It survives the cold chain storage and causes listeriosis in vulnerable individuals.

New parasites like *Cryptosporidium parvum*, which are resistant to chlorine and other disinfectants are being detected in treated municipal water which had otherwise been declared safe for drinking. North American outbreaks of cyclosporiasis, due to protozoan parasite *Cyclospora cayetanensis*, provide another example of a new disease which is now endemic in more than 27 countries. *Campylobacter jejuni* is now considered as the most common bacterial food-borne pathogen in most countries with several reporting the emergence of antibiotic-resistant strains. *Salmonella typhimurium DT104*, which infected wild and farm animals, is now increasing making people sick as well. Non-typhoidal strains of Salmonella are also increasingly leading to illness.

The threat of animal diseases being transmitted to humans has also been a major concern. Confirmed instances of the avian influenza viruses infecting humans have been documented. The type of virus with the greatest risk is the highly pathogenic avian influenza HPAI strain, H5N1. Outbreaks have become more common due to intensive poultry production. The influenza virus has shown presence of genes that have been adapted from both human and avian strains. Transmissible Spongiform Encephalopathies (TSEs) are another example of diseases which have emerged as a result of altering natural feed of animals. The prion disease jumped species and was implicated in human deaths as well.
Other examples of emerging pathogens include – *Toxoplasma gondii*, *Shigella*, *Vibrio parahaemolyticus*, *Yersinia enterocolitica*, etc. Antimicrobial Resistant (AMR) microbes is a growing concern which can be blamed on indiscriminate use of antimicrobial drugs, poor quality antimicrobials and use for non-therapeutic purposes in both humans and animals.

**Chemical hazards**

Use of new chemicals in food production, processing and packaging is introducing newer contaminants into our food supply. Earlier chapters have highlighted these concerns regarding pesticide residues, drugs used in animal husbandry and other chemical contaminants either occurring naturally in foods or being produced during processing or leaching into food from equipment or packaging. Advancements in analytical methods and equipment is enabling us to detect contaminants in foods which we considered as safe, with the prime example being of phthalates and other chemicals migrating from plastic bottles to water/food being stored in it. Plastic debris in the marine environment is contaminating the fish and other seafood with a cocktail of chemicals and microplastics.

**Microplastics – An Emerging Threat**

The United Nations warned about the presence of microplastics in fish in their Environment Project report for 2016. These tiny bits of plastic land up in the rivers and oceans due to poor waste disposal methods. They are ingested by marine life, which is food for man, thus increasing the risk of human exposure to these tiny bits of plastic and the chemicals present in plastics.

Milk, meat and eggs are usually the animal products in which residues of veterinary drugs were suspected, however in 2010 there was report of antibiotic residues in honey in India. This was because in commercial beekeeping, the bees are susceptible to infections and antibiotics are regularly used to tackle infections. Similarly, pesticide residues usually believed to be a problem in grains, vegetables and fruits are also finding their way into a greater number of processed foods and beverages in which contaminated water and raw ingredients have been used.

**Ban on serving food in a newspaper**

Use of newspaper for wrapping or serving food has been banned in India since 2016 as newsprint is made of toxic chemicals which leach into the food.

Chemical hazards may also naturally be present in plants and animals as has been discussed in earlier chapters. Increase in trade between countries has also introduced new foods to the population of the importing countries. In the country of origin, the local population had devised household cooking/processing techniques to get rid of these toxins. The technique if not transferred to the importing country could result in them suffering the adverse effects. Factors such as climate change and ocean acidification have probably resulted in increased risk of toxic algal blooms and its outbreaks in India.
Ciguatera fish poisoning was identified in 2016 in Indian city of Mangalore. The samples of *Lutjanus bohar* and *Pristipomoides filamentosus* tested in 2016 from Karnataka and Kerala region were found positive for ciguatoxins. Its presence in the fish does not affect the taste, odour or appearance of the fish which makes it difficult to identify and remove the contaminated fish. Lack of an accurate method to detect the disease in humans and toxin present in fish also make this toxin an important concern in food safety.

**Consumer fear regarding Food Irradiation and Genetically Modified Foods**

The possibility of change in the structure of food components like proteins on exposure to irradiation or the production of a new harmful substances is a fear among consumer groups. Similarly, genetic modification of crops is looked at as ‘meddling with nature,’ which can result in production of allergenic food or food leading to adverse health effects. Long term studies to demonstrate the safety of these foods need to be carried out.

**Trends in Consumption**

There is an increased awareness among people about diet-related diseases across the world. This has triggered the trend of seeking 'health foods' and unfortunately 'quick-fix' solutions which do not need too much of an effort on the part of the individual. This has popularised fad diets or use of superfoods which promise health miracles or an ideal body shape.

**Fad diets**

Fad diets are popular diets which promise rapid weight loss or some other health benefit for which there is no real scientific evidence. These diets promote short-term changes instead of life-long changes. Their popularity has no association with the diet’s effectiveness, nutrition soundness or safety. They, like fashion, gain popularity and a following for some time till they lose favour or until the scientific community highlights the adverse health effects that the diet is likely to cause. Most of these diets are low-calorie, weight-loss diets. Others are based on physiological or biochemical parameters like blood group. Creators of these diets often engage celebrities to endorse their diets. Most fad diets promise quick-fix solutions without much effort on the part of the consumer.

**Box 1: How to spot a Fad diet**

Fad diets can be easily identified as they tend to have the following features:

- Promoting only specific food groups or asking you to remove or drastically cut out certain food groups (for instance removing grains, vegetables, etc.)
- Promising rapid weight loss (more than 1 kg/week)
- Providing no scientific or medical evidence and relying on testimonies of celebrities or other individuals
- Offering ‘herbal’ supplements along with diet plan which will ‘melt’ or ‘burn’ the body fat.
Fad diets can sometimes lead to health problems. This is most often because they recommend cutting out of key foods from the diet. A number of these diets (e.g. Atkins, Keto diets, etc.) are low carbohydrate diets requiring the person to virtually cut out grains and some vegetables from the daily menu. Though keto diets have shown beneficial effects in patients of epilepsy, there is very little research data showing advantages for normal healthy people. In addition, diets high in animal protein have also been associated with increased urinary loss of calcium and increased load on kidneys. Some diets recommend the consumption of large amounts of a single food (like Cabbage Soup Diet, Banana and Milk Diet, Boiled Egg Diet, etc.). These diets cannot meet the nutrient needs of the body. Diets which drastically cut down on calories or any specific food group should only be undertaken on medical advice and under the supervision of a professional nutritionist. Trying out these diets on one's own often results in symptoms like weakness, fatigue, dehydration, nausea and headaches. Highly restrictive fad diets should hence be avoided. These diets are not sustainable as they are very different from regular diets which people are accustomed to consuming. People tend to regain any weight lost as soon as they revert to their regular diet and lifestyle.

**Understanding Superfoods**

The dietary guidelines of all countries emphasize the need for healthy food patterns and making healthy food choices from all food groups. Few foods however stand out from the others in being packed with beneficial nutrients and phytochemicals. Including these in daily diets enhances the diet quality and offers additional health benefits beyond those attributed to the function of nutrients present in them. These foods are referred to as ‘functional foods’ or ‘superfoods.’ The list of superfoods is long, and several benefits are attributed to them (Table 1). The beneficial effects are attributed to bioactive substances present in them. What is important to understand is that these foods add to the quality of diets and by themselves cannot be responsible for maintaining health of individuals consuming them. People still need to practice healthy lifestyles and eat nourishing meals. The term ‘superfood’ may also be used by some as a marketing gimmick to trick consumers into buying certain food products. These products usually tend to contain one or more of ‘superfruits’ or ‘supergrains’ as ingredients. Any health claims made about the products should be supported by scientific research data.
Table 21.1: Some 'Superfoods' to Include in your Diet

<table>
<thead>
<tr>
<th>Superfood</th>
<th>Bioactive ingredients/nutrients</th>
<th>Health benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Berries</td>
<td>Anthocyanins, fibre</td>
<td>Rich in antioxidants, protect against cancer, cardiovascular disease, etc.</td>
</tr>
<tr>
<td>Fatty fish (e.g. salmon, tuna, mackerel, sardines, etc.)</td>
<td>Omega 3 fatty acids</td>
<td>Important for brain development and health, protects against cardiovascular diseases</td>
</tr>
<tr>
<td>Dark green leafy vegetables (spinach, mustard greens, kale, etc.)</td>
<td>β-carotene, calcium, iron, fibre, several phytochemicals</td>
<td>Important for synthesis of haemoglobin, bone, eyes, and general health</td>
</tr>
<tr>
<td>Nuts (walnuts, almonds, etc.)</td>
<td>MUFA, protein</td>
<td>May reduce risk of cardiovascular diseases</td>
</tr>
<tr>
<td>Olive oil</td>
<td>MUFA, vitamin E, polyphenols</td>
<td>May reduce risk of cardiovascular diseases</td>
</tr>
<tr>
<td>Whole grains (oats, millets, brown/black rice, etc.)</td>
<td>Soluble and insoluble fibre, B vitamins, minerals and phytochemicals</td>
<td>Help in lowering cholesterol, protect against cardiovascular diseases, diabetes</td>
</tr>
<tr>
<td>Curd or yoghurt</td>
<td>Calcium, protein, live cultures of beneficial bacteria</td>
<td>Good for gut health, bones</td>
</tr>
<tr>
<td>Cruciferous vegetables (broccoli, cabbage, cauliflower, mustard greens, radishes, and turnips, etc)</td>
<td>Fibre, vitamins, and phytochemicals including indoles, thiocyanates</td>
<td>Protect against some cancers</td>
</tr>
<tr>
<td>Tomatoes</td>
<td>Lycopene</td>
<td>May reduce risk of some cancers</td>
</tr>
<tr>
<td>Turmeric</td>
<td>Curcumin</td>
<td>Reduces inflammation, antioxidant, antiseptic</td>
</tr>
<tr>
<td>Tea especially green tea</td>
<td>Flavonoids like catechins and epigallocatechin gallate</td>
<td>May reduce risk of cancer, rich in antioxidants</td>
</tr>
</tbody>
</table>

Using technology to tackle challenges

Documenting the outbreak of food borne illnesses is one of the biggest challenges in India. Hospitals and physicians play an important role in notifying the government about any new disease or pathogen they suspect. To deal with the problem, real time monitoring and tracking needs to be done with hospitals and clinics uploading on dashboards any newly detected cases of food borne illness and, hence establishing an accessible database. Similarly, data on any hazard detected in food and likely to become a public health problem needs to be communicated effectively to the public with guidelines on how to manage the risk. Effective communication among stakeholders is the key to controlling and limiting disease outbreaks and minimizing consequent economic losses. With advances in communication technology this has become easier.
Food processing

New and improved technology is also helping to improve food production – increasing productivity, preserving nutrients and improving safety. Microwave Assisted Thermal Sterilization (MATS) is a new patented technology which promises to provide packaged meals which seem freshly cooked in flavour and appearance and which retain their original nutrients. In conventional processing packaged food is kept in pressurized cookers to inactivate pathogens, spoilage microorganisms and enzymes. To mask the damage caused by long exposure to high temperature, additional flavours or colour may be added to food. MATS technology significantly reduces thermal processing time and improves nutrient, flavour and colour retention. This is a post packaging sterilisation process in which a 915M Hz microwave signal induces dielectric heating within the packaged food, which is immersed in pressurized hot water, resulting in a much shorter heating step (Barbosa-Cánovas et al., 2014; DSTO, 2019).

Food packaging

Fruits and vegetables are one of the essential components of our daily diet providing us with vitamins, essential minerals, antioxidants, dietary fibres etc. However, fruits and vegetables are highly perishable commodities which can spoil during the pre- and post-harvest period due to spoilage microorganisms, insects, temperature, stress factor etc. The shelf-life of food is directly related to the type of packaging technology used.

Edible coating/packaging is one of the effective methods to tackle this problem. It provides a two-fold solution. Not only does it protect the wholesomeness of the fruits/vegetables by shielding it from the external environment, but also does not cause any harm to the environment since it is easily degradable. Edible coating can be safely consumed along with the fruit or vegetable (Raghav et al., 2016).

Food transport and storage

Contamination can enter at any stage of food supply chain from farm to fork which includes production, processing, packing, transportation, storage, shelf display and consumption. Achieving the objectives of food quality partly relies on physical traceability throughout the chain. As a result, the management of the supply chain, more significantly the cold chain related to the manufacture, distribution and sale of perishable, and condition-sensitive products, should be given high priority.

Better methods of traceability of food products can also limit economic loss and adverse health consequences. If a certain batch of food is found to be a health threat, then it can be traced and recalled from the market preventing people from getting exposed to the hazard. Radiofrequency Identification (RFID) Technology is increasingly being used to trace products in the supply chain. RFID is a form of auto-identification, like a bar code or a license tag containing a unique serial number. RFID tags can also incorporate additional data such as details of product and manufacturer and can transmit measured environmental factors such as temperature and relative humidity. RFID technology can be applied in the food industry for supply chain management, temperature monitoring of
foods, and ensuring food safety by tracking of food products during distribution and storage. These tags also monitor the shelf life of food products such as meat, fruit, dairy etc. to which they are attached. The tag senses temperature and integrates it over time to determine the shelf life of a product, which can be communicated to a reader. RFID technology has also been used in monitoring the ripening of climacteric fruits during transportation and vending. Efforts are on to develop mobile apps which can be used to check whether, for instance, the packet of frozen food you are buying was kept frozen throughout its journey from the factory to the supermarket shelf! You would probably not buy the frozen food if you discovered that it thawed during storage at a warehouse or supermarket because the power went off (Kumar et al., 2009).

Another new technology is that of Thermochromic labelling which uses a special ink on the package of food products. These are used for products which need to be kept at certain temperatures during storage or need to be served at a particular temperature. The ink changes colour when the threshold temperature is reached informing the consumer whether the food is now safe to eat. These sensor tags slowly change after a package has been opened and indicate when the time has come to discard the food. The colour of the sensors changes more quickly if the product is not stored at the proper temperature and indicates spoilage of food due to temperature or storage abuse. It is also being used in some countries to let the consumers know for instance, whether their food is hot enough to eat or their beer is chilled enough to drink.

Use of Internet of Things (IOT) Solution for the food supply chain has become more relevant to the practical world due to increased use of mobile devices, cloud computing and data analytics in the recent years. The IOT refers to a type of network to connect anything with the Internet based on stipulated protocols through information sensing equipment to achieve smart recognitions, positioning, tracing, monitoring, and administration. The application of IoT in food supply chains is considered as one of the promising applications in near future to address the traceability and monitoring of the complex supply chain. Application of IoT covers all sectors of food production from farm to plate by providing real-time visibility and enables the automated, intelligent actions needed to ensure food does not get degraded or contaminated, is prepared in optimal settings and is delivered on time (Nirenjana et al, 2018).

Block Chain Technology is a decentralized accounting system in which entries are recorded in sequence in multiple identical “ledgers” stored on computers in multiple locations. This makes tampering with any one ledger futile, creating a highly trusted record of transactions. This technology works by integrating growers, distributors and retailers on a common blockchain which includes a trusted record of all data of a given food’s journey through the end-to-end supply chain. Through this the user can trace the origin of a “contaminated” ingredient of the product in seconds which would have taken days by tracing through mix data of written and digital records. With this capability, retailers and restaurants can remove a contaminated item from circulation almost immediately and destroy only stock that came from that particular source. A blockchain-based cloud platform has been developed for the food industry by IBM Food Trust and is already employed by major food sellers.
Food safety testing

Advancement in techniques and instruments for detecting hazards has greatly contributed to management of hazards. These have an edge over conventional methods in that they can detect much lower levels of the contaminant and with greater accuracy. Food fraud/adulteration in meat, dairy, fish, etc. can now be tested by making use of the unique DNA composition of animals. Conventional DNA based molecular techniques are generally costly, time consuming and need trained staff. These challenges can be addressed by the DNAFoil technology, which is a portable and completely self-administered, on-site DNA test that does not require expensive PCR equipment or laboratory settings to confirm detection of food adulteration and it does it in as little as 30 minutes. It is a kit test method which includes a barrel that breaks, lyses, extracts, neutralizes and stabilizes DNA from various food matrices. This extracted DNA can be amplified by using enzymes and primers which can be further detected by running on test strip. Coupling micrometer-sized beads to DNA allows the results to be visualized by the naked eye (visible color reaction), enabling instant, simple to interpret, cost-efficient, and on-site detection, while eliminating the need for advanced expensive instrumentation. These DNAFoil kits are sensitive for target contamination and can detect any level of adulteration (down to 0.01%). These kits are also tolerant to a complex, high-salt, high-fat food matrix and do not require prior DNA purification and quantitation (Sheikha, 2019).

Raman Technology based rapid tests use Raman spectroscopy (RS) and its various derivative methods. It has been widely applied in detection of various substances in food. RS is a technique specialized in measuring the frequency shift of inelastic scattered light from the sample. When the photons from incident light strike a molecule, scattering photons of different frequency appear. These scattering photons are called as Raman Scattering and Raman spectroscopy is based on the effect of Raman scattering (Weng et al, 2019). Raman Spectroscopy is old technology but now a days it is coupled with machine learning and artificial intelligence to detect adulterants in edible oils and ghee. These are handheld devices and can be used as a pre-scanning equipment to detect the adulteration, so that analysts in laboratories don’t spend time and resources to test a sample which is already pure.

BioSensors – Bioelectric Tongue and Nose are analytical instruments comprising an array of nonspecific, low-selective, chemical sensors. They are now incorporated with biosensors to improve its performance and can be used in detection and quantification of pesticides, contaminants in several food and water samples. It can also be used in monitoring the ageing of beers, determination of analytes or markers in food products and detection of spoilage microorganisms in different foodstuff. These devices are fast, reliable and easy to use and satisfy the current demand of the food sector to detect various adulterants, contaminants, flavours etc. (Ceto et al., 2016; Podrazka et al., 2018).
Future of food

With advancement of technology and strides being made in the field of food science we can look forward to new food products which are safer and more wholesome. Smart agriculture solutions are likely to boost yields. Better transport and storage will reduce food waste by letting companies monitor conditions like temperature and humidity in real time. Science based solutions which make efficient use of resources is the thrust of all innovations in the food sector.

Researchers have developed a 3D printing technology to prepare food using ingredients like millets, green gram, spices, etc. Taking just five to seven minutes to print, followed by a microwave drying process, this technology may help in customizing food according to the individuals’ requirements.

New and innovative techniques are being used to assess and manage risks. Statistics, for instance, is being used for predictive modelling of microbiological outcomes. Predictive microbiology now offers risk managers scientific tools to estimate the consequences of different food handling and processing conditions on growth, survival and inactivation of pathogenic microorganisms. They will for instance, be able to predict if the food product is still safe after being transported at a particular temperature for a specified length of time, or if the power outage during its journey would have led to the spoilage. The United States Department of Agriculture (USDA) uses predictive microbiology to manage risks across the food chain using computational resources and sophisticated statistical packages (https://portal.errc.ars.usda.gov/). Databases like ComBase are now available for big and small food companies providing information on how microbes respond to different environmental conditions and how the microbe levels change over the course of time. Initiatives to develop microbiological modelling programs have been ongoing in the United States, the United Kingdom, Denmark, France, Australia and other countries for a number of years. These programs have resulted in the development of a wide range of microbiological modelling software packages.

Nutrigenomics

Nutritional genomics is a new discipline which has been formed by the integration of the study of nutrition, molecular biology and genomics. It is the science of how nutrients affect the activities of genes (nutrigenomics) and how genes affect the interactions between diet and disease (nutrigenetics). This new science teaches us what specific foods tell our genes to do. Every protein which is synthesized by the cell is a product of gene expression. Nutrients and phytochemicals can interact with genomes causing changes in their expression. At the same time, deficiency of a nutrient can hamper DNA repair and hence normal function. If we learn how our genes operate, the instructions that the genes give to the body and its metabolism, we can radically change how food interacts with our body. This information can be used to lose weight and optimise health by preventing development of diseases.

Individuals may respond differently to the same diet- whereas one individual may put on weight if given a dessert daily, another may not gain an ounce. These varied responses to diet have been attributed to differences in genetic make-up. An exploration of nutrient-gene interactions is important for determining what will be healthful for an individual and
what could result in increasing the risk of diet-related diseases. Nutrigenomics will ultimately one day help to tailor diets based on individual’s genetic make-up. Nutrigenomics can be used in the future for development of customized nutraceuticals based on specific genetic profiles.

**New food science**

Food companies are also experimenting with *plant-based meat* to prepare burgers, sausages, etc. thereby reducing carbon footprint. In addition, scientists are producing *Cultured/Lab Grown Meat*. Such meat eliminates the need to sacrifice animals by growing muscle tissue in culture from animal stem cells. Cultured/in-vitro meat can be constructed and produced faster than the traditional meat with desired characteristics. Although appreciable progress has been made during recent years, important issues, including safety, characterization of social and ethical conditions, and the development of cost-effective culture media needs to be resolved. Consumer acceptance and confidence in cultured meat might be an important obstacle that might hinder the marketing process (Kadim et al., 2015).

In the interest of reducing chemicals used in foods for preservation, the search for natural antimicrobials has proposed the use of bacteriophages (viruses) which attack and kill disease causing bacteria. Studies have also proposed a cocktail of viruses to be consumed to tackle foodborne illness. This alternative approach uses lytic bacteriophages for managing bacterial infections. Although, antibiotics are an important way to manage diseases caused by pathogens, they kill beneficial microbes in the human gut system. Also, many bacteria are developing resistance to antibiotics, which makes the treatment more complicated (Moye et al, 2018).

**Gastronomic tourism**

Gastronomic tourism has become a major and rapidly growing component of the attractiveness of tourist destinations. People wishing to experience the local tastes in other countries or different states of their country, travel just for the gastronomic experience. The tourism industry is also rising to the expectations of tourists by organising gastronomic tours for experiencing the local cuisine. Such tours consist not only of food guides taking people to restaurants, but also organising cooking demonstrations, cooking classes, visits to vineyards, local food manufacturers and other kinds of culinary experiences. With the growth in this kind of tourism comes the immense responsibility of all stakeholders in providing safe and wholesome food to tourists. With street foods being a major attraction in most cities, creation of Street Food Hubs which provide safe food is an important step in promoting gastronomic tourism. These hubs have been certified by FSSAI after imparting vendors with the necessary training and capacity building.

While special efforts are being made to promote traditional cuisines and revive ancestral recipes, equal strides are being made in exploring new tastes and enhancing flavours of existing dishes. *Molecular gastronomy* is a scientific discipline which looks at the science behind food preparation- the physical and chemical transformations which take place during cooking of food. The knowledge is now being used to create new dishes and culinary techniques. Various new recipes have made their way to restaurant menus using
new ingredients or processing methods for preparation and food service. For instance, ice creams and cocktails served with liquid nitrogen are increasing becoming popular. While these foods are very attractive to look at and tickle the palates with new taste sensations, this experimentation needs to be done with great care and diligence. The dish shouldn’t turn into a chemical experiment which is unmindful of the safety or the wholesomeness of the food (Cousins et al., 2010; Gheorghe et al., 2014; This, 2013).

Fake news and role of media

Need a question to be answered? The internet offers opportunities to access a lot of information. Although there is a lot of good quality nutrition information available, there is an abundance of misleading or inaccurate information as well. Social as well as other forms of media are also full of information. You may often find it difficult to distinguish valid nutrition information from misinformation. A good way to know is to look at the source of information – can the source be trusted? The person/body providing the nutrition information should be qualified to do so. Box 2 lists some pointers for you to discern whether a website is reliable.

Box 2: Is this website reliable? Questions to ask

To determine whether a website is reliable to offer nutrition information, ask the following questions:

1. **Where is the information coming from?** The web address generally gives a clue. Web addresses ending in ‘gov’ usually belong to the government, ‘edu’ are associated with educational institutes and ‘org’ belong to organizations. These are generally reliable. The ones ending in ‘com’ represent businesses and one would need to check on their credentials.

2. **Who is giving the information?** Is the author a qualified professional? Has the information been reviewed by experts in the field or is it just someone’s blog or personal view on the subject?

3. **When was the website last updated?** The website could have out-dated information. Nutrition is an ever-changing science, what is valid today may not be applicable a few years later.

4. **Why is the website providing this information?** Is the information there for public good or does the organization/business have a commercial interest like selling a product?

5. **What is the message?** Read beyond the headline/caption and see the details of the article. Is the information in agreement with other reliable sources of information or contradicting common knowledge? If it goes against the existing knowledge, then it is advisable to cross-check with other resources as well.

Hazard of fake news

Fake news consists of deliberate misinformation spread through traditional news media or social media. Digital media has increased the spread of fake news. Fake news is written and published usually with the intent to mislead in order to damage an agency, entity, or person, and/or gain financially or politically, often using sensationalist, dishonest, or outright fabricated headlines to increase readership. For media outlets, the ability to attract viewers to their websites is necessary to generate online advertising revenue. Publishing a story with false content that attracts users, benefits the advertisers and improves their ratings.
Some news items tell a lopsided story, basing it on results of a single research study or without a balance of expert opinions. As a result, the news item may become controversial. Tight deadlines and limited understanding of the scientific aspects of research studies may lead to inaccurate reporting which misleads the consumer and creates confusion. Box 3 highlights some red flags for identifying fake news on social media.

**Box 3: Red flags for Fake News/Information on Social Media**

These are some pointers to look for to know that the information circulated on social media is fake news:

- News is sensational and you have never heard about it from reliable sources. For instance, miracle cures attributed to a food product or claims that a food product in circulation has been made from non-edible harmful substances
- The sender asks you to ‘Forward to all the people you know’
- The message is forwarded, and you don’t have a clue as to who is the original sender and whether they are a subject expert.
- The message has been debunked on websites.

**Responsibility of media**

The media is a very powerful entity as it moulds public opinion. Fake news in any kind of media whether mass media or social media has in the past triggered riots and violence. Fabricated and exaggerated claims in the media are not just related to politics but from time to time one has come across news related to public health and nutrition. Such kind of news or claims are not just misleading but also damaging to health. They create a lot of mistrust and erode the trust placed in media.

In 2018, several newspapers reported of a WHO advisory that ‘if adulteration of milk and milk products is not checked immediately, 87% of citizens would be suffering from serious diseases like cancer by the year 2025 (in India)’. FSSAI had ascertained that no such advisory was issued by the WHO at all and FSSAI or WHO were not even approached for clarifications.

It is hence the responsibility of the media houses and social media platforms to clamp down on fake news. Media needs to increase coverage on aspects of food safety and nutrition which educate the public about eating safe and healthy food. However, there have been many instances of circulation of false and malicious videos on various social media platforms on safety and quality of food available in the country. It is a matter of serious concern as it leads people to believe that most of the food available in the country is unsafe (see box 4).
False propaganda is neither good for citizens nor for food businesses. It also erodes global trust in our food system and food businesses, and potentially has far reaching public health, social and trade implications. Press Council of India has issued an advisory to all the media houses, to verify all facts before publishing any news related to food safety.

Summary

- Changes in the food consumption behaviour, globalization, new technologies of food production, increasing mobility of population, climate change and a greater strain on the public health infrastructure have led to the emergence of newer food safety issues.

- Emerging pathogens of concern are those pathogens which are either causing a new illness or the number of cases is now increasing sharply, or they are spreading the disease over a wider geographical area.

- Multidrug resistant microbes like Salmonella, Brucella, etc. are causing major problems. Outbreaks due to Listeria are increasing in recent years. Cryptosporidium parvum, Cyclospora cayetanensis, Campylobacter jejuni, Non-typhoidal strains of Salmonella, avian influenza viruses, Toxoplasma gondii, Shigella, Vibrio parahaemolyticus, Yersinia enterocolitica, etc. are some emerging biological hazards.
• Uncontrolled use of growth hormones and antibiotics, environmental contaminants such as Persistent bioaccumulative toxins, chemicals leaching from plastics, newspapers, packaging materials etc. are some examples of emerging chemical hazards.

• In an attempt to stave off diet-related chronic diseases, people are looking for quick solutions like fad diets or superfoods. Unless coupled with healthy lifestyle changes and balanced and wholesome diets, these trends can result in adverse health effects.

• Advancements in technology have helped tackle some challenges related to the food sector. Improved processing technologies, better methods of transporting, storing and packaging have led to safer food with better shelf life.

• Radiofrequency Identification (RIFD) Technology is increasingly being used to trace products in the supply chain. Thermochromic labelling which uses a special ink are used for products which need to be kept at certain temperatures during storage. Block chain technology is a decentralized accounting system in which entries are recorded in sequence in multiple identical “ledgers” stored on computers in multiple locations. This makes tampering with any one ledger futile, creating a highly trusted record of transactions.

• Advancements in techniques and instruments for detecting hazards has greatly contributed to management of hazards.

• Predictive microbiology is used as a scientific tool to estimate the consequences of different food handling and processing conditions on growth, survival and inactivation of pathogenic microorganisms.

• Nutrigenomics as a science can one day help to tailor diets based on individual’s genetic make-up and for development of customized nutraceuticals based on specific genetic profiles.

• Gastronomic tourism has become a major and rapidly growing component of the attractiveness of tourist destinations.

• With advancement of technology and strides being made in the field of food science we can look forward to new food products which are safer and more wholesome. Science based solutions which make efficient use of resources is the thrust of all innovations in the food sector.

• Fake news consists of deliberate misinformation spread through traditional news media or social media. False propaganda is neither good for citizens nor for food businesses. It also erodes global trust in our food system and food businesses, and potentially has far reaching public health, social and trade implications.
Key Terms

**Gastronomic tourism** - food guides taking people to restaurants, but also organising cooking demonstrations, cooking classes, visits to vineyards, local food manufacturers and other kinds of culinary experiences.

**Microplastics** – extremely small pieces of plastic debris in the environment

**Molecular gastronomy** - is a scientific discipline which looks at the science behind food preparation- the physical and chemical transformations which take place during cooking of food.

**Nutrigenomics** - as a science can one day help to tailor diets based on individual’s genetic make-up and for development of customized nutraceuticals based on specific genetic profiles.

**Predictive microbiology** - is used as a scientific tool to estimate the consequences of different food handling and processing conditions on growth, survival and inactivation of pathogenic microorganisms

Exercises

1. Define emerging food safety issues and discuss factors responsible for their emergence.

2. Describe the important emerging microbial and chemical hazards giving suitable examples.

3. Define Antimicrobial Resistance. Why is resistance to antibiotics a problem in India?

4. What is Radiofrequency Identification (RIFD) Technology? How is it useful in Food traceability?

5. Define Nutrigenomics and discuss its role in personalized nutrition.

6. What do you understand by Gastronomic Tourism?

7. Define role and responsibilities of media in addressing the problem of fake news.

8. Describe some advancements which have been made in food safety testing.

Activity

Do a literature review and list some breakthroughs in food processing/ packaging/ food testing technology.
References


16. This, H. (2013). Molecular gastronomy is a scientific discipline and note by note cuisine is the next culinary trend. Flavour, 2(1), 1.