

Chapter 11: Regulatory Food Testing Ecosystem

- **Types of food testing laboratories in India**
 - *Role of Food laboratories*
- **Accreditation of laboratories**
- **Strengthening the food testing ecosystem**
 - *Capacity building of Food laboratories*
 - *Significance of competent staff in food laboratories*
 - *Significance of Rapid Test methods*
 - *Connecting with Consumers*

Chapter 11: Regulatory Food Testing Ecosystem

In any effective regulatory food system, a food testing ecosystem is critical to evaluate the quality and safety of foods, their compliance to set standards and also identify any emerging risks from farm to fork or plate to palate. This would, directly or indirectly, help various stake holders in eliminating unsafe food from the supply chain or avoid their consumption. Simultaneous development of infrastructure, qualified technical manpower and time-tested harmonized methods are needed to make any food testing ecosystem a robust and efficient one.

Establishment of a robust regulatory food testing ecosystem involves following vital components:

- Food testing laboratories at state and national levels with advanced facility and equipment.
- Pool of Competent Staff
- Efficient capacity building system
- System to oversee the competence of testing in these laboratories through accreditation and certification.

Food testing laboratories ensure an effective food safety mechanism in the country. They play an important role in ensuring safety and quality of food through testing of foods/food products for adulterants/contaminants and for assessment of product quality and nutritive value.

Types of food testing laboratories in India

As per FSS Act, 2006 “food laboratory means any food laboratory or institute established by the Central or a State Government or any other agency and accredited by National Accreditation Board for Testing and Calibration Laboratories or an equivalent accreditation agency and recognised by the Food Authority under section 43”. The section 43 of FSS Act 2006 empowers FSSAI

- to notify food laboratories and research institutions accredited by National Accreditation Board for Testing and Calibration Laboratories or any other accreditation agency for the purposes of carrying out analysis of samples.
- to establish or recognise by notification, one or more referral food laboratory or laboratories
- to frame regulations specifying the functions of food laboratory and referral food laboratory, procedure for submission of food samples for analysis, forms of the laboratory’s reports, analysis fee and other matters to carry out its functions effectively.

FSSAI has formulated FSS (Laboratory and Sample Analysis) Regulations, 2011 to specify the functions of Referral laboratories, sampling procedure and formats for sample submission and analysis report. Further, FSS (Recognition and Notification of Laboratories) Regulations, 2018, was framed for recognition and notification of laboratories to improve and streamline the process of notification of food laboratories. These regulations not only provide a legal foundation for the operation of the laboratory system that already exists under the ambit of FSS Act 2006, but also usher transparency by defining the procedural requirements for the recognition and notification of food testing laboratories. The categorizations of laboratories notified by FSSAI are shown in Figure 1.

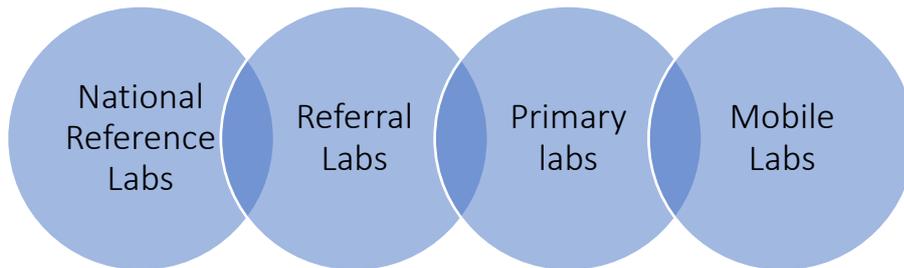


Figure 11.1: Categories of Laboratories Notified by FSSAI

The roles and responsibilities of all laboratories notified by FSSAI are given below:

National Reference Laboratories (NRL's): FSSAI has recognized around 15 of its primary and referral laboratories as NRLs, for the purpose of developing/verifying/validating methods of testing, assessing proficiency of notified food labs, providing training to the laboratory personnel and develop repository of information in a designated product/analyte category. These NRLs would set up a country wide standard for routine procedures, reliable testing methods and validation of such standard procedure/testing methods, development of new methods and ensuring proficiency in testing across the food laboratories with special reference to the risks or food categories. Once operationalized, all the NRLs would be brought into a single umbrella called the Network of NRLs (NNRLs) forming another subset of higher tier laboratories.

Referral Food Laboratories (RFL's): FSSAI has notified around 19 referral laboratories which include state government labs, research Institutes and private NABL labs. These referral labs are responsible for the analysis of food samples submitted by food safety inspectors and providing the certificate of analysis. RFLs are also responsible for investigation for the purpose of fixation of standard of any article of food, capacity building, collaboration with state labs and food analyst, maintaining high standards of accuracy, reliability and credibility in the analysis, ensuring competency of the laboratories.

Primary Laboratories: Any laboratory accredited against ISO/IEC 17025 by the National Accreditation Board for Testing and Calibration Laboratories or other equivalent accreditation agency and having adequate capability and competence for testing of food safety and quality parameters as per FSS Act can apply online to be notified by FSSAI. Several such laboratories have been notified for the purpose of carrying out analysis of food samples taken under the Food Safety and Standards Act 2006 and Rules and Regulations made thereunder.

Mobile labs: Availability of testing facilities in remote areas is a greater challenge which needs to be addressed on a priority basis in order to assure safe food to citizens in those parts of the country. To address this issue of lack of food testing infrastructure in the remote areas and to cater to the basic analytical needs of consumers, FSSAI has also established mobile food testing laboratories referred to as Food Safety on Wheels (FSW). Apart, from conducting simple tests for common adulterants in milk, water, edible oil and other items of food of daily consumption, the FSW would also be used for awareness building around food safety, hygiene and promoting healthy eating habits in citizens at large. Apart from testing and training, the FSWs would also help regulatory staff or the field functionaries in the states to enhance their outreach; and, also help in conducting surveillance activities even in far-flung areas.

Role of Food laboratories

Food analysis laboratories play crucial role in enforcement of food regulations including monitoring and surveillance activities of food safety. They don't just monitor foods produced in the country but also help in regulating imported foods and their safety. The sample taken by the food safety officer as per FSS Act is analysed by a FSSAI notified lab to test its compliance against set standards and its authenticity. The risk-based analysis of imported products for its compliance against FSS quality and safety parameters and clearance is also done by FSSAI notified labs. In addition to this, food laboratories are integral component of all monitoring and surveillance activities done by FSSAI. The INFoLNET (See Box 1) provides back-end integration with existing core IT solutions like Food Licensing & Registration system (FLRS) and Food Import Clearance System (FICS) for the ease of doing business.

Box 1: Digitization and networking of food laboratories in India

FSSAI has developed an information technology solution for benefit of food testing laboratories in the country called the Indian food laboratory network or INFoLNET. In this, all the laboratories in the network will be connected to a centralized system. The INFoLNET also integrates with FSSAI's core IT system such as licence, registration, imports, surveillance etc. INFoLNET allows the laboratories to centrally digitise information related to their activities such as, their testing facility, manpower details, infrastructure details, sample management & tracking and publishing test reports. They are also provided interface to share laboratory test reports on a real time basis with stakeholders. These are hoped to result in better handling of samples and surveillance activity apart from creating a transparent system that would build stakeholder confidence in food testing.

A new online feature called Surveillance Regulatory Compliance has been introduced in this network. In this, states can plan and initiate their surveillance with the advantage of having lab information at common place under the preview of FSSAI HQ.

Accreditation of laboratories

Laboratory accreditation is a procedure by which an authoritative body gives formal recognition of technical competence for specific tests/ measurements. It is based on third party assessment and follows international standards. This formal recognition of competence of a laboratory creates confidence in testing reports issued by the laboratory. It also provides feedback to the labs on their quality assurance system and technical competence for further improvement.

In India, National Accreditation Board for Testing and Calibration Laboratories (NABL), a Constituent Board of Quality Council of India is the nodal agency for the accreditation of food testing laboratories. NABL has been established with the objective to provide Government, Industry Associations and Industry in general with a scheme for third party assessment of the quality and technical competence of testing and calibration laboratories against ISO/IEC 17025. ISO/IEC 17025 is an international standard which enables laboratories to demonstrate that they operate competently and generate valid results, thereby promoting confidence in their work both nationally and around the world.

Strengthening the food testing ecosystem

Certain critical inputs are required to strengthen the food safety ecosystem. Building the capacity of laboratories and training and developing competence of food analysts are important. In addition, there is need for innovative initiatives which can strengthen the role of laboratories in enforcement, monitoring and surveillance as well as empower consumers.

Capacity building of Food laboratories

Capacity building is as a process aimed at strengthening the skills of individuals as well as of food labs to cope with new trends and the emerging changes. FSSAI through its various initiatives and collaborations with Government institutions, International bodies and Private laboratories ensures continuous upgradation of technical skills of Food Analysts and other laboratory staff with the aim to acquaint them with latest analytical techniques and methods. State of art training facilities are critical in providing classroom training and hands on training on new and advanced analytical techniques. One such facility is being created at Mumbai in association with EIC and GFSP. This facility would also help in creation of a mechanism to share information and best practices among a network of scientific peers on continuous basis.

Significance of competent staff in food laboratories

Competency of staff is one of the important components of any food laboratory apart from its infrastructure and testing facility. In order to create a pool of competent staff, FSSAI regularly conducts Food Analyst examination through a rigorous selection process as per the FSS Act, 2006. The objective is to identify and encourage qualified technical manpower for the food testing laboratories. These certified food analysts are responsible for analysis of food samples submitted by food safety officers for enforcement or

surveillance purpose. ISO 17025 also prescribes requirements and technical qualifications for the personnel involved in the food analysis of samples. Inefficient staff may generate erroneous analytical results adversely impacting the process of prosecution of food vendors.

Significance of Rapid Test methods

The incidence of foodborne diseases has increased over the years and resulted in major public health problems globally. Generally, foodborne diseases are caused by the consumption of food or water contaminated with microbial or chemical contaminants. To provide safe food to the consumers and to minimize the occurrence of foodborne diseases it is essential to analyse the food for the presence of foodborne pathogens or chemical contaminants. From simple visual inspections and chemical analyses to microbial assays and culturing techniques, food quality assurance has come a long way. These conventional methods are time-consuming and multi-step processes, with prolonged incubation periods, amplifying opportunities for human error.

In recent years, different rapid methods with high sensitivity and specificity have been developed to overcome the limitations of conventional methods. Furthermore, researchers are still developing novel methods with improvements in terms of rapidity, sensitivity, specificity and suitability for analysis of food samples. Generally, rapid detection methods are categorized into nucleic acid-based, biosensor-based and immunological-based methods. Rapid methods are more time-efficient, labour-saving and able to reduce human errors. In addition, the equipment are also space saving and do not require a complex setup and advance trainings. They can be installed in mobile labs for food analysis and creating awareness. These devices can be easily operated, and data can be stored by connecting them electronically.

Connecting with Consumers

Section 40 of the FSS Act 2006 empowers the purchaser to get analysed any article of food from the food laboratories on submitting the requisite fees. In case the sample is found unsafe the fee submitted by the purchaser is refunded. While most of the food testing requires sophisticated equipment and highly trained manpower, there are some common adulterants and contaminants that can be tested by citizens themselves. In order to enable the citizens to ascertain the safety of their food themselves, FSSAI has compiled some of the common tests - which can be performed at home without any equipment or chemicals - in the form of a booklet titled **Detecting Adulterants with Rapid Testing (DART)**. In addition, FSSAI has also developed a magic box, which can be used by the consumers to detect adulteration with a few simple tests at home. These magic boxes can also be used as a tool for creating awareness among citizens. The mobile labs of FSSAI i.e. 'Food safety on wheels' also help in creating consumer awareness on food adulteration through simple and rapid test methods.

Thus, we have seen how a food testing ecosystem is critical in assessing the quality and safety of foods and identifying emerging risks. Capacity building of laboratories notified by FSSAI as well as training of food analysts in the latest techniques of analysis is important to strengthen the food testing. Developing information technology solutions and accreditation of the laboratories will further strengthen the ecosystem. Empowering the consumer is also important for the ecosystem.

Summary

- In any effective regulatory food system, a food testing ecosystem is critical to evaluate the quality and safety of foods, their compliance to set standards and also identify any emerging risks from farm to fork or plate to palate.
- FSSAI has formulated FSS (Laboratory and Sample Analysis) Regulations, 2011 to specify the functions of Referral laboratories, sampling procedure and formats for sample submission and analysis report.
- FSS (Recognition and Notification of Laboratories) Regulations, 2018, was framed for recognition and notification of laboratories to improve and streamline the process of notification of food laboratories.
- Laboratories notified by FSSAI are categorized as National Reference Labs, Referral Labs, Primary Labs and Mobile labs.
- Food analysis laboratories play crucial role in enforcement of food regulations including monitoring and surveillance activities of food safety.
- FSSAI has developed an information technology solution for benefit of food testing laboratories in the country called the Indian food laboratory network or INFoLNET.
- Laboratory accreditation is a procedure by which an authoritative body gives formal recognition of technical competence for specific tests/ measurements. It is based on third party assessment and follows international standards.
- In India, National Accreditation Board for Testing and Calibration Laboratories (NABL), a Constituent Board of Quality Council of India is the nodal agency for the accreditation of food testing laboratories.
- Capacity building is as a process aimed at strengthening the skills of individuals as well as of food labs to cope with new trends and the emerging changes.
- Competency of staff is one of the important components of any food laboratory apart from its infrastructure and testing facility.
- Different rapid methods with high sensitivity and specificity have been developed to overcome the limitations of conventional testing methods.
- The DART book, the Magic Box and Mobile labs are some consumer connect initiatives which not only spread awareness but also empower consumers.

Key Words

DART - Detecting Adulterants with Rapid Testing

FICS – Food Import Clearance System

FLRS - Food Licensing & Registration System

FSW- Food Safety on Wheels

INFoLNET - Indian Food Laboratory Network

ISO/IEC 17025 - an international standard which enables laboratories to demonstrate that they operate competently and generate valid results, thereby promoting confidence in their work both nationally and around the world.

NNRL – Network of National Reference Laboratories

Exercises

1. What are the different categories of labs certified by FSSAI? Describe the mandate of each kind of lab.
2. What is the INFoLNET? How does it benefit the food testing laboratories?
3. Which nodal agency in India is designated for accreditation of food testing laboratories?
4. Discuss how capacity building of food laboratories and food analysts will help strengthen the food testing ecosystem.
5. What are the benefits of using rapid tests for analysis of food?
6. List the consumer connect initiatives of FSSAI which are meant for creating awareness about food testing as well as empowering the consumers to test the food themselves.

References

1. FSSAI. Food Safety And Standards (Laboratory And Sample Analysis) Regulations, 2011. Available at
2. https://www.fssai.gov.in/upload/uploadfiles/files/Lab_Sample_Regulations.pdf
3. FSSAI. Food Safety and Standards (Recognition and Notification of Laboratories) Regulations, 2017. Available at
4. https://www.fssai.gov.in/upload/uploadfiles/files/Gazette_Notification_Labs_16_11_2018.pdf

5. FSSAI. Food Safety & Standards Act, 2006 Available at <https://www.fssai.gov.in/cms/act-2006.php#>
6. FSSAI. Food Safety and Standards Rules, 2011 Available at https://www.fssai.gov.in/upload/uploadfiles/files/FSS_Gazete_Rules_2011.pdf
7. FSSAI. Mobile Food Testing Labs. Available at <https://www.fssai.gov.in/cms/mobile-labs.php>
8. Role of public health food safety laboratories in detection of adulterants/contaminants (<https://www.sciencedirect.com/science/article/pii/B9780128017739000121?via%3Dihub>)
9. Rapid methods for the detection of foodborne bacterial pathogens: principles, applications, advantages and limitations (<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4290631/>)
10. Rapid test methods: A versatile tool to assist food-safety management https://www.researchgate.net/publication/264372532_Rapid_test_methods_A_verseatile_tool_to_assist_food-safety_management
11. Zeng L, Wang L and Hu J. (2018). Current and Emerging Technologies for Rapid Detection of Pathogens. Biosensing Technologies for the Detection of Pathogens - A Prospective Way for Rapid Analysis. <https://www.intechopen.com/books/biosensing-technologies-for-the-detection-of-pathogens-a-prospective-way-for-rapid-analysis/current-and-emerging-technologies-for-rapid-detection-of-pathogens>
12. Kanagasabapathy A.S and Rao P (2005). Laboratory accreditation - procedural guidelines, Indian Journal of Clinical Biochemistry, 2005, 20 (2) 186-188
13. FSSAI (2019). Metastudy on Food Testing Laboratories In India. Food And Agribusiness Strategic Advisory & Research (FASAR). YES Bank Limited New Delhi.
14. Brereton P, Galsworthy D and Foster I. Proposal to develop a framework for international food safety laboratories' training and capacity building. Food and Environment Research Agency, Sand Hutton, York
15. NABL 100.(2018). General Information brochure. National Accreditation Board for Testing and Calibration Laboratories (NABL). Published by NABL/QCI.
16. FSSAI. INFoLNET. Indian Food Laboratory Network. Available at <https://infolnet.fssai.gov.in/#/>