

MICROBIAL FOOD SAFETY – INDIAN REGULATIONS

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FOOD SAFETY

- Concept that food will not cause any harm to the consumer when it is prepared and/or eaten according to its intended use.

(Codex Alimentarius Food Hygiene Basic Texts. Food and Agriculture Organization of the United Nations, World Health Organization, Rome, 2001)

FOOD SAFETY HAZARD

- Biological, chemical or physical agent in food, or condition of food, with the potential to cause an adverse health effect.

(Codex Alimentarius Food Hygiene Basic Texts. Food and Agriculture Organization of the United Nations, World Health Organization, Rome, 2001)

FOOD-BORNE DISEASES

- Food-borne diseases are defined as diseases, usually either infectious or toxic in nature, caused by agents that enter the body through the ingestion of food.

FOODS INVOLVED

- ✓ Meat and meat products,
- ✓ Poultry,
- ✓ Eggs,
- ✓ Milk and milk products,
- ✓ Sweetmeats
- ✓ Fruits and vegetable
- ✓ Rice preparations

SYMPTOMS

- ❖ Diarrhea is the most common symptom of food-borne illness, but other serious consequences include kidney failure, brain and nerve disorders, and death.

GRAVITY OF SITUATION

- ❖ Data indicates that up to 30% of the population in industrialized countries may be affected by food-borne illness each year and the problems are likely to be even more serious in developing countries.
- ❖ The global incidence of food-borne disease is difficult to estimate, but in 2005 it was estimated that 2.2 million people, including 1.8 million children, died from diarrheal diseases.
- ❖ Microbiological hazards represent 93% of the incidents of food-borne illness and are the major problems not only in developing countries but also in developed countries.

GRAVITY OF SITUATION

- ❖ In the US alone food-borne illness due to microbiological hazards is resulting in more than 10000 deaths each year. According to a WHO report cases of food poisoning are on the increase even in the industrialized countries like USA and Japan.
- ❖ Approximately two million children die annually from diarrheal diseases, while hundreds of millions suffer from frequent episodes of diarrhea and its debilitating consequences, mostly caused by food or water-borne pathogens (WHO, 2000)
- ❖ Even in India though no data are available, microbiological food safety hazards are a common and major health hazard taking several lives frequently causing morbidity and mortality.

MICROBIOLOGICAL FOOD SAFETY HAZARDS – THE CULPRITS

- Microbial Food Safety is an essential public health issue of all countries.
- Estimated 250 food-borne pathogens

- **Bacteria**

- **Viruses**

- **Parasites**

ANNUAL ECONOMIC BURDEN

In US alone:

- ✓ **76 million illnesses**
- ✓ **325,000 hospitalizations**
- ✓ **5,000 deaths**

✓ **\$23 billion in costs**

**Estimated annual burden
of food-borne disease**

This figure includes:

- **Medical cost**
- **Productivity losses (missed work)**
- **Value estimate of premature death**

PROBLEM CONTINUES

- ❖ Despite remarkable advances in food science and technology, food-borne illness is a rising cause of morbidity in all countries and the list of potential food-borne microbial pathogens keeps increasing.
- ❖ Limited data on food-borne disease and its impact on public health.

Problem continues emphasizing the importance of ensuring microbial food safety.

MICROBIAL FOOD SAFETY – INDIAN REGULATIONS

- In India, microbial food safety is being enforced through various regulatory mechanisms:
 - Prevention of Food Adulteration (PFA) Act, 1955
 - Quality control orders issued under Essential Commodities Act, 1955 such as Fruit Product Order (FPO), 1955, Meat Food Products Order (MFPO), 1973, Milk and Milk Product Order (MMPO), 1992
 - Agricultural Produce (Grading & Marking) act, 1937

PREVENTION OF FOOD ADULTERATION RULES, 1956

- *Prevention of Food Adulteration (PFA) Rules, 1956* specifies microbiological requirements for pathogens such as
 - ✓ *E. coli*,
 - ✓ *Staphylococcus aureus*,
 - ✓ *Salmonella & Shigella*,
 - ✓ *Vibrio cholerae*,
 - ✓ *V. parahaemolyticus*,
 - ✓ *Clostridium perfringens*,
 - ✓ *C. botulinum*,
 - ✓ *Listeria monocytogenes*

in foods commonly involved in food-borne diseases, such as sea food, milk and milk products, meat and meat products, fruit and vegetable products, packaged drinking water, mineral water etc.

PREVENTION OF FOOD ADULTERATION RULES, 1956

APPENDIX B DEFINITIONS AND STANDARDS OF QUALITY

SPICES AND CONDIMENTS

Caraway Whole, Caraway Black Whole, Caraway Powder, Cardamom (Whole, Seeds and Powder), Large Cardamom (Whole, Seeds and Powder), Chillies and Capsicum (Whole and Powder), Cinnamon (Whole and Powder), Cassia (Whole and Powder), Cloves (Whole and Powder), Coriander (Whole and Powder), Cumin (Whole and Powder), Cumin Black (Whole and Powder), Fennel (Whole and Powder), Fenugreek (Whole and Powder), Ginger (Whole and Powder), Mace (Whole and Powder), Mustard (Whole and Powder), Nutmeg (Whole and Powder), Pepper Black (Whole and Powder), Saffron (Whole and Powder), Turmeric (Whole and Powder), Aniseed Whole, Ajowan, Pepper White (Whole and Powder) and Dried Garlic Whole

Salmonella : Absent in 25g

PREVENTION OF FOOD ADULTERATION RULES, 1956

APPENDIX B DEFINITIONS AND STANDARDS OF QUALITY

INFANT MILK FOOD

INFANT FORMULA

MILK –CEREAL BASED COMPLEMENTARY FOOD

PROCESSED CEREAL BASED COMPLEMENTARY FOOD

FOLLOW-UP FORMULA-COMPLEMENTARY FOOD

- **Bacterial Count** per gram (not more than) 10,000
- **Coliform Count** absent in 0.1 gram
- **Yeast and mould count** absent in 0.1 gram
- **Salmonella and Shigella** absent in 25 gram
- **E.coli** absent in 0.1 gram
- **Staphylococcus aureas** absent in 0.1 gram

PREVENTION OF FOOD ADULTERATION RULES, 1956

APPENDIX B DEFINITIONS AND STANDARDS OF QUALITY

MALTED MILK FOOD

a) Without cocoa powder

- **Bacterial count** Not more than 50,000 per gram
- **Coliform count** Not more than 10 per gram

b) With cocoa powder

- **Bacterial count** Not more than 50,000 per gram
- **Coliform count** Not more than 10 per gram
- **Yeast and Mould count** absent in 0.1 gram
- **Salmonella and Shigella** absent in 0.1 gram
- **E.coli** absent in 0.1 gram
- **Vibrio cholera and V. Paraheamolyticus** absent in 0.1 gram
- **Faecal streptococci and Staphylococcus aureas** sent in 0.1 gram

PREVENTION OF FOOD ADULTERATION RULES, 1956

APPENDIX B DEFINITIONS AND STANDARDS OF QUALITY

MALT BASED FOODS (MALT FOOD)

- **Total Plate Count** Not more than 50,000 per gram
- **Coliform count** Not more than 10 per gram
- **Yeast and Mould count** Not more than 10 per gram
- **Salmonella and Shigella** absent in 25 gram
- **Vibrio cholera and V. Paraheamolyticus** absent in 0.1 gram
- **Faecal streptococci and Staphylococcus aureas** absent in 0.1 gram

PREVENTION OF FOOD ADULTERATION RULES, 1956

APPENDIX B DEFINITIONS AND STANDARDS OF QUALITY

SOLVENT EXTRACTED SOYA FLOUR

SOLVENT EXTRACTED GROUNDNUT FLOUR

SOLVENT EXTRACTED SESAME FLOUR

SOLVENT EXTRACTED COCONUT FLOUR

SOLVENT EXTRACTED COTTON SEED FLOUR

- **Total bacterial count** not more than 50,000 per gram
- **Coliform bacteria** not more than 10 per gram
- **Salmonella bacteria** Nil in 25 gram

PREVENTION OF FOOD ADULTERATION RULES, 1956

APPENDIX B DEFINITIONS AND STANDARDS OF QUALITY

MINERAL WATER

- **Yeast and mould counts** Absent
- **Salmonella and Shigella** Absent
- **E. coli or thermotolerant Coliforms** 1 x 25 ml Absent
- **Total coliform bacteria** 1 x 250 ml Absent
- **Faecal streptococci and staphylococcus aureus** 1 x 250 ml Absent
- **Pseudomonas aeruginosa** 1 x 250 ml Absent
- **Sulphite-reducing anaerobes** 1 x 50 ml Absent
- **Vibrocholera** 1 x 250 ml Absent
- **V. paraheamolyticus** 1 x 250 ml Absent

PREVENTION OF FOOD ADULTERATION RULES, 1956

APPENDIX B DEFINITIONS AND STANDARDS OF QUALITY

PACKAGED DRINKING WATER (OTHER THAN MINERAL WATER)

- **Yeast and mould counts** 1 x 250 ml Absent
- **Salmonella and Shigella** 1 x 250 ml Absent
- **E. coli or thermotolerant Coliforms** 1 x 250 ml Absent
- **Coliform bacteria** 1 x 250 ml Absent
- **Fecal streptococci and staphylococcus aureus** 1 x 250 ml Absent
- **Pseudomonas aeruginosa** 1 x 250 ml Absent
- **Sulphite-reducing anaerobes** 1 x 50 ml Absent
- **Vibrocholera** 1 x 250 ml Absent
- **V. paraheamolyticus** 1 x 250 ml Absent
- **Aerobic Microbial Count** The total viable colony count shall not exceed 100 per ml at 20 C to 22 C in 72 h on agar-agar or on agar-gelatin mixture, and 20 per ml at 37 C in 24 h on agar-agar.

PREVENTION OF FOOD ADULTERATION RULES, 1956

APPENDIX B DEFINITIONS AND STANDARDS OF QUALITY

MEAT AND MEAT PRODUCTS

CORNED BEEF, LUNCHEON MEAT, COOKED HAM, CHOPPED MEAT, CANNED CHICKEN, CANNED MUTTON AND GOAT MEAT

- **Total plate count** 1000/gram maximum
- **E. coli** Absent in 25 gram
- **Samonella** Absent in 25 gram
- **Staphylococcus aureus** Absent in 25 gram
- **Clostridium perfringens** and **Clostirdium botulinum** Absent in 25 gm

FROZEN MUTTON, GOAT, BEEF AND BUFFALO MEAT

- **Total plate count** 10000/gram maximum
- **E. coli** 100/gram maximum
- **Samonella** Absent in 25 gram
- **Staphylococcus aureus** 100/gram maximum
- **Clostridium perfringens** and **Clostirdium Botulinum** 30/gm max
- **Listeria monocytogenes** Absent in 25 gram
- **Yeast and mould count** 1000/gram maximum

PREVENTION OF FOOD ADULTERATION RULES, 1956

APPENDIX D TABLE 1 MICROBIOLOGICAL REQUIREMENTS FOR SEA FOOD

Sl.No.	Name of product	Total Plate Count	E. coli	Staphylococcus aureus	Salmonella and Shigella	Vibrio cholerae	Vibrio parahaemolyticus	Clostridium prefringens
1.	Frozen shrimps or Prawns							
	Raw	Not more than five lakhs/gm	Not more than 20/gm	Not more than 100/gm	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	
	Cooked	Not more than one lakhs/gm	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	
2.	Frozen Lobsters							
	Raw	Not more than five lakhs/gm	Not more than 20/gm	Not more than 100/gm	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	
	Cooked	Not more than one lakhs/gm	Absent in 25 gm	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	
3.	Frozen Squid	Not more than five lakhs/gm	Not more than 20/gm	Not more than 100/gm	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	--
4.	Frozen Fin Fish	Not more than five lakhs/gm	Not more than 20/gm	Not more than 100/gm	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	--
5.	Frozen fish fillets or minced fish flesh or mixtures thereof	Not more than five lakhs/gm	Not more than 20/gm	Not more than 100/gm	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	--
6.	Dried shark fins	Not more than five lakhs/gm	Not more than 20/gm	Not more than 100/gm	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	--

PREVENTION OF FOOD ADULTERATION RULES, 1956

APPENDIX D TABLE 1 MICROBIOLOGICAL REQUIREMENTS FOR SEA FOOD

Sl. No.	Name of product	Total Plate Count	E. Coli	Staphylococcus aureus	Salmonella and Shigella	Vibrio cholerae	Vibrio parahaemolyticus	Clostridium prefringens
7.	Salted fish/dried salted fish	Not more than five lakhs/gm	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	--
8.	Canned finfish	Nil	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm
9.	Canned shrimp	Nil	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	--
10.	Canned Sardines or sardine type products	Nil	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	--
11	Canned salmon	Nil	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	--
12	Canned crab meat	Nil	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	--
13	Canned Tuna and Bonito	Nil	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	--

PREVENTION OF FOOD ADULTERATION RULES, 1956

APPENDIX D TABLE 2 MICROBIOLOGICAL REQUIREMENTS FOOD PRODUCTS

Sl. No.	Products	Parameters	Limits
1.	Thermally processed fruits and vegetable products	a) Total plate count b) Incubation at 37 C for 10 days and 55 C for 7 days	a) Not more than 50/ml b) No change in pH
2.	i) Dehydrated fruits and vegetable products ii) Soup powders iii) Desiccated coconut powder iv) Table olives v) raisins vi) Pistachio nuts vii) dates viii) Dry fruits and nuts	Total plate count	Not more than 40,000/gm
3.	Carbonated beverages, ready-to-serve beverages including fruit beverages	a) Total Plate Count b) Yeast and mould count c) Coliform count	Not more than 50cfu/ml Not more than 2.0cfu/ml Absent in 100 ml
4.	Tomato Products a) Tomato juices and soups b) Tomato Puree and Paste c) Tomato ketchup and Tomato Souce	a) Mould Count b) Yeast and Spores a) Mould Count a) Mould Count b) Yeast and Spores c) Total Plate count	Positive in more than 40.0 percent of the field examined Not more than 125 per 1/60 c.m.m. Positive in more than 60.0 percent of the field examined Positive in more than 40.0 percent of the field examined Not more than 125 per 1/60 c.m.m. Not more than 10000/ml

PREVENTION OF FOOD ADULTERATION RULES, 1956

APPENDIX D TABLE 2 MICROBIOLOGICAL REQUIREMENTS FOOD PRODUCTS

Sl. No.	Products	Parameters	Limits
5.	Jam/Marmalade/Fruit Jelly/Fruit Chutney and Sauce	a) Mould Count b) Yeast and Spores	Positive in more than 40.0 percent of the field examined
6.	Other fruits and Vegetables products Covered under item A.16 to Appendix B.	Yeast and Mould Count	Not more than 125 per 1/60 c.m.m.
7.	Frozen Fruits and Vegetable products	Total Plate Count	Not more than 40000/gm
8.	Preserves	Mould Count	Absent in 25 gm/ml
9.	Pickles	Mould Count	Absent in 25 gm/ml
10.	Fruit Cereal Flakes	Mould Count	Absent in 25 gm/ml
11.	Candied and Crystallised or Glazed Fruit and Peel	Mould Count	Absent in 25 gm/ml
12.	i)All Fruits Vegetable Products and Ready to Serve Beverages including Fruit Beverages and Synthetic Products covered under A. 16 of Appendix 'B' ii)Table olives iii)Raisins iv)Pistachio nuts v)Dates vi)Dryfruits and nuts vii)vinegars	a)Flat Sour Organisms b) Staphylococcus aureus c) Salmonella d) Shigella e) Clostridium botulinum f) E.co;i. g) Vibrio Cholera	Not more than 1000 cfu/gm for those products which have pH less than 5.2 Absent in 25 gm/ml Absent in 25 gm/ml Absent in 25 gm/ml Absent in 25 gm/ml Absent in 1 gm/ml Absent in 25 gm/ml

S.No	Requirement	Ice Cream/frozen Dessert/Milk Lolly/ Ice Candy/Dried Ice Cream Mix	Cheese/Processed	Evaporated Milk	Sweetened Condensed Milk	Butter	Butter Oil/Butter Fat and Ghee	Yoghurt/Dahi
1.	Total Plate Count	Not more than 2,50,000/gm	Not more than 50,000/gm	Not more than 500/gm	Not more than 500/gm	Not more than 500/gm	Not more than 500/gm	Not more than 10,00,000/gm
2.	Coliform Count	Not more than 10/gm	Absent in 0.1 gm	Absent in 0.1 gm	Absent in 0.1 gm	Not more than 5/gm	Absent in 0.1 gm	Not more than 10/gm
3.	E.Coli	Absent in 1 gm	Absent in 1 gm	Absent in 1 gm	Absent in 1 gm	Absent in 1 gm	Absent in 1 gm	Absent in 1.0 gm
4.	Salmonella	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.
5.	Shigella	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.	Absent in 25 gm.
6.	Staphylococcus aureus	Absent in 1 gm	Absent in 1 gm	Not more than 100/gm	Not more than 100/gm	Absent in 1 gm	Absent in 1 gm	Not more than 100/gm
7.	Yeast and Mould Count	Absent in 1 gm	Absent in 1 gm	Absent in 1 gm	Not more than 10/gm	Not more than 20/gm	Absent in 1 gm	Not more than 100/gm
8.	Anaerobic Spore Count	Absent in 1 gm	Absent in 1 gm	Not more than 5/gm	Absent in 1 gm	Absent in 1 gm	Absent in 1 gm	Absent in 1 gm
9.	Listeria monocytogenes	Absent in 1 gm	Cheese other than hard cheese: Absent in 25 gm	Absent in 1 gm	Absent in 1 gm	Absent in 1 gm	Absent in 1 gm	Absent in 1 gm

ESSENTIAL COMMODITIES ACT, 1955

- A number of quality control orders issued under Essential Commodities Act, 1955 such as
 - ✓ Fruit Product Order (FPO), 1955,
 - ✓ Meat Food Products Order (MFPO), 1973,
 - ✓ Milk and Milk Product Order (MMPO), 1992
- These aim at regulating sanitary and hygienic conditions at all levels of supply chain and lay down sanitary and hygienic conditions of premises, surrounding environment and personnel.
- Though FPO, 1955 also lays down product specifications, they do not address issues related to microbiological characteristics adequately.

AGRICULTURAL PRODUCE (GRADING & MARKING) ACT, 1937

- ❖ Lays down Agmark standards for raw and semi-processed food
- ❖ Focus area is information to the consumer about the products, manufacturers etc.
- ❖ Few Agmark standards address issues related to microbiological characteristics but are grossly inadequate.

SHIFT TOWARDS AN HOLISTIC APPROACH

- These regulations prescribe food standards but do not seek to identify and prevent source of contamination.

India is now reorienting its food regulation to emphasize and ensure food safety, food hygiene and food quality as an holistic approach.

FOOD SAFETY AND STANDARDS ACT, 2006

- An act to **consolidate the laws** relating to food and to **establish the Food Safety and Standards Authority of India** for laying down science based standards for articles of food and **to regulate their manufacture, storage, distribution, storage, distribution, sale and import**, to ensure availability of safe and wholesome food for human consumption and for matters connected therewith or incidental thereto.

FSSA, 2006 bring the different pieces of legislation pertaining to food safety under one umbrella which will override the PFA, 1955 and various Quality Control Orders under Essential Commodities Act, 1955.

The aim is to better coordinate and integrate food safety controls across India to give highest level of health protection

BUREAU OF INDIAN STANDARDS



- ❖ Indian National Standards are formulated by National Standards Body - Bureau of Indian Standards (BIS).
- ❖ Bureau of Indian Standards (BIS), erstwhile ISI, works under the aegis of Ministry of Consumer Affairs, Food and Public Distribution, Govt. of India.
- ❖ It is governed by Bureau of Indian Standards Act, 1986 and Rules and Regulations framed there under.
- ❖ BIS has been entrusted the job of formulation of National Standards under an Act of Parliament.

STANDARDIZATION - IN FOOD & AGRICULTURE

Food and Agriculture Department of Bureau of Indian Standards has formulated various standards since inception and has so far developed around 1800 standards in the following areas:



- **PESTICIDES**
- **SUGAR**
- **APIARY**
- **TOBACCO**
- **LIVESTOCK FEEDS, EQUIPMENT**
- **STIMULANT FOODS**
- **SOIL QUALITY AND FERTILIZERS**
- **FOOD ADDITIVES**
- **SPICES AND CONDIMENTS**
- **PROCESSED FRUITS AND VEGETABLE**
- **AGRICULTURAL TRACTORS**

STANDARDIZATION - IN FOOD & AGRICULTURE



- FISH AND FISHERIES PRODUCTS
- OILS AND OILSEEDS
- DRINKS AND CARBONATED BEVERAGES
- FOOD HYGIENE, SAFETY MANAGEMENT
- FOODGRAINS, STARCHES & READY TO EAT FOODS
- IRRIGATION SYSTEMS,
- FARM IMPLEMENTS
- SLAUGHTER HOUSE AND MEAT
- DAIRY PRODUCTS AND EQUIPMENT
- AGRICULTURE AND FOOD PROCESSING EQUIPMENTS
- AGRICULTURE MANAGEMENT & SYSTEMS
- BIOTECHNOLOGY
- SPELIZED PRODUCTS

THESE STANDARDS ARE FOR :-

- ✓ PRODUCTS
- ✓ SYSTEMS
- ✓ TEST METHODS
- ✓ CODE OF SAFETY
- ✓ CODE OF PRACTICE
- ✓ GLOSSARY OF TERMS
- ✓ SPECIAL PUBLICATIONS/NATIONAL CODE

HOW STANDARDS – ARE FORMULATED !!!



➤ Through National Technical Committees – Sectional Committees – Comprising all Stakeholders :-

- ✓ Industries.
- ✓ Government Bodies/Regulators.
- ✓ Research Organizations.
- ✓ End Users
- ✓ Consumer Organizations
- ✓ Experts

INDIAN STANDARDS AND MICROBIAL FOOD SAFETY

- ❖ Limits of microbiological parameters for processed food products are specified in respective Indian Standards. As far as microbiological criteria are concerned Indian Standards are elaborate.
- ❖ BIS has formulated standards on test methods for detection and enumeration of pathogenic microorganisms in food and specifications for ingredients used in media for microbiological work.
- ❖ BIS has also formulated code of hygienic conditions for various food industries.
- ❖ BIS has adopted Codex HACCP and Food Hygiene guidelines and ISO 22000 as Indian Standards.

MICROBIOLOGICAL METHODS OF TEST

IS 5401(Part 1):2002/ ISO 4832:1991	Microbiology – General guidance for enumeration of coliforms : Part 1 Colony count technique (first revision)
IS 5401(Part 2):2002/ ISO 4831:1991	Microbiology – General guidance for estimation of coliforms : Part 2 MPN technique (first revision)
IS 5402:2002/ ISO 4833:1991	General Guidance for the enumeration of microorganisms – Colony count technique at 30 °C (first revision)
IS 5403:1999/ ISO 7954:1987	Methods for yeast and mould count of food stuffs and animal feeds (first revision)
IS 5404:1984	Methods for drawing and handling of food samples for microbiological analysis (first revision)
IS 5887(Part 1):1976	Methods for detection of bacteria responsible for food poisoning: Part 1 Isolation, identification and enumeration of <i>Escherichia coli</i> (first revision)

MICROBIOLOGICAL METHODS OF TEST

IS 5887(Part 2):1976	Methods for detection of bacteria responsible for food poisoning: Part 2 Isolation, identification and enumeration of <i>Staphylococcus aureus</i> and fecal streptococci (first revision)
IS 5887(Part 3):1999/ ISO 6579:1993	Methods for detection of bacteria responsible for food poisoning: Part 3 General guidance on methods of detection of <i>Salmonella</i> (second revision)
IS 5887(Part 4):1999	Methods for detection of bacteria responsible for food poisoning: Part 4 Isolation and identification of <i>Clostridium perfringens, C. botulinum</i> and enumeration of <i>C. perfringens</i> (second revision)
IS 5887(Part 5):1976	Methods for detection of bacteria responsible for food poisoning: Part 5 Isolation, identification and enumeration of <i>Vibrio cholerae and Vibrio parahaemolyticus</i> (first revision)
IS 5887(Part 6):1999/ ISO 7932:1993	Methods for detection of bacteria responsible for food poisoning: Part 6 Identification, enumeration and confirmation of <i>B. Cereus</i>

MICROBIOLOGICAL METHODS OF TEST

IS 5887(Part 7):1999	Methods for detection of bacteria responsible for food poisoning: Part 7 General guidance on methods of detection of <i>Shigella</i>
IS 5887(Part 8/Sec1):2002/ ISO 6888-1:1999	Methods for detection of bacteria responsible for food poisoning: Part 8 Horizontal method for enumeration of coagulase positive staphylococci (<i>Staphylococcus aureus</i> and other species) Section 1 Technique using Baird-Parker Agar Medium
IS 5887(Part 8/Sec2):2002/ ISO 6888-2:1999	Methods for detection of bacteria responsible for food poisoning: Part 8 Horizontal method for enumeration of coagulase positive staphylococci (<i>Staphylococcus aureus</i> and other species) Section 2 Technique using rabbit plasma fibrinogen Agar Medium
IS 7402:1996	Microbiology – General guidance for the enumeration of Enterobacteriaceae without resuscitation – MPN technique and colony count technique (first revision)

MICROBIOLOGICAL METHODS OF TEST

IS 10232:2003/ ISO 6887-1 :1999	General rules for the preparation of initial suspension and decimal dilutions for microbiological examination of foods (first revision)
IS 14397:1996	Detection, isolation and identification of pathogenic <i>E. coli</i> in food
IS 14987:2001/ ISO 8914:1990	Microbiology – General guidance for detection of <i>Vibrio parahaemiluticus</i>
IS 14988(Part 1):2001/ ISO 11290-1:1996	Microbiology of food and animal feeding stuffs – Horizontal method for detection and enumeration of <i>Listeria monocytogenes</i> : Part 1 Detection method
IS 14988(Part 2):2001/ ISO 11290-2:1996	Microbiology of food and animal feeding stuffs – Horizontal method for detection and enumeration of <i>Listeria monocytogenes</i> : Part 1 Enumeration method

MICROBIOLOGICAL METHODS OF TEST

IS 15185:2002/ ISO 9308-1:2000	Water Quality – Detection and enumeration of E. coli and coliform bacteria - Membrane filtration method
IS 15186:2002/ ISO 7899-2:2000	Water Quality – Detection and enumeration of intestinal enterococci - Membrane filtration method
IS 15187:2002/ ISO 6340:1995	Water Quality – Detection of salmonella species
IS 15188:2002/ ISO 8199:1988	Water Quality – General guide to the enumeration of microorganisms by culture
IS 14843:2000/ ISO 13720:1995	Meat and Meat products – Enumeration of <i>Pseudomonas Sp.</i>
IS 14844:2000/ ISO 13721:1995	Meat and Meat products – Enumeration of lactic acid bacteria – Colony count technique at 30 °C
IS 14920:2001/ ISO 13681:1995	Meat and Meat products – Enumeration of yeasts and mould – Colony count technique
IS 15463:2004/ ISO 6391:1997	Meat and Meat products – Enumeration of Escherechia coli – Colony count technique at 44 °C using membranes.

CODE FOR HYGIENIC CONDITIONS

IS 4303(Part 1):1975	Code for hygienic conditions in fish industry : Part 1 Pre-processing stage (first revision)
IS 4303(Part 2):1975	Code for hygienic conditions in fish industry : Part 2 canning stage (first revision)
IS 5059:1969	Code for hygienic conditions for large scale biscuit manufacturing units and bakery units
IS 5837:1970	Code for hygienic conditions for soft drink manufacturing units
IS 5839:2000	Food hygiene – Code of practice for manufacture, storage and sale of ice creams (first revision)
IS 6074:1971	Code of functional requirements of hotels, restaurants and other food service establishments
IS 6540:1972	Code of hygienic conditions for manufacturing and handling of ice for human consumption
IS 6541:1972	Code of hygienic conditions for establishment and maintenance of mid-day school meal programmes

CODE FOR HYGIENIC CONDITIONS

IS 6542:1972	Code for hygienic conditions for fruits and vegetable canning units
IS 6968:1973	Code for hygienic conditions for Pan (Betel leaf) stalls and vendors
IS 6969:1973	Code of hygienic conditions for handling and sale of refrigerated drinking water
IS 7003:1973	Code for hygienic conditions for sago (saboodana) manufacturing unit
IS 7005:1973	Code of hygienic conditions for production, processing, transportation and distribution of milk
IS 7802:1975	Code for hygienic conditions for sweetmeat shop
IS 8123:1976	Code of hygienic conditions for sale of cut fruits, fruit juice and fruit salad
IS 8124:1976	Code of hygienic conditions for sale of sugarcane juice

CODE FOR HYGIENIC CONDITIONS

IS 8182:1976	Code for hygienic conditions for processed meat products
IS 10793:1984	Code for hygienic conditions for food hawkers
IS 10974(Part 1):1984	Code for hygienic conditions for production, transport, storage and distribution of indigenous milk products : Part 1 Khoa and Khoa based sweets
IS 10974 (Part 2):1984	Code for hygienic conditions for production, transport, storage and distribution of indigenous milk products : Part 2 Dahi
IS 10974 (Part 3):1984	Code for hygienic conditions for production, transport, storage and distribution of indigenous milk products : Part 3 Coagulated products, Chhana and Chhana based sweetmeats
IS 10974 (Part 4):1984	Code for hygienic conditions for production, transport, storage and distribution of indigenous milk products : Part 4 Frozen products, Kulfi

CODE FOR HYGIENIC CONDITIONS

IS 10974(Part 5):1984	Code for hygienic conditions for production, transport, storage and distribution of indigenous milk products : Part 5 Fermented products, Shrikhand
IS 14134:1994	Code for hygienic practices for processing and handling of quick frozen foods
IS 14135:1994	Code for hygienic practices for dehydrated fruits and vegetables including edible fungi
IS 14216:1994	Code for hygienic conditions for spices and condiments processing units
IS 14348:1996	Code for hygienic conditions for alcoholic beverages industry
IS 14349:1996	Code for hygienic conditions for edible oil and vanaspati manufacturing units
IS 14350:1996	Code for hygienic conditions in sugar factories

FOOD HYGIENE, HACCP AND FSMS

- ❖ IS 2491:1998 Food Hygiene – General Principles – Code of Practice (second revision)
- ❖ IS 14595:1998 Food Hygiene – Microbiological Criteria Principles for establishment and application
- ❖ IS 15000:1998 Food Hygiene – Hazard Analysis and Critical Control Point (HACCP) – Systems and guidelines for its application
- ❖ IS 22000:2005 Food safety management systems – Requirements for any organization in the food chain

IMPORTANT STANDARDS UNDER FORMULATION

- Codes for good practices to guide food business operators at all levels of the food chain
- ✓ Good Hygienic Practices (GHP)
- ✓ Good Manufacturing Practices (GMP)
- ✓ Good Retail Practices (GRP)
- ✓ Good Agricultural Practices (IndiaGAP)

WAY AHEAD

- **Using risk analysis and science based decision to design regulation.**
- **Recognizing that a coherent farm to table approach is desirable for addressing food safety hazards.**
- **Numerous approaches like GHP, GMP, GRP, GAP, HACCP, FSMS can be incorporated into regulations to ensure safe food both microbial and chemical.**
- **Adapting HACCP system with its PRPs as a basis of new regulation of microbial pathogens in food.**
- **Developing a regulatory system responsive towards evolving new food products and emerging concerns for food safety and ecology.**
- **Ensuring traceability through food regulations.**
- **Monitoring and surveillance activities.**

THANK YOU