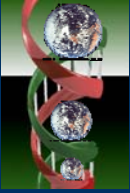


Overview of Food Safety Issues

P.K. Seth

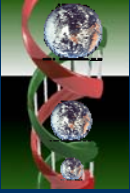
**Chief Executive Officer, Biotech Park, Lucknow &
Former Director, Indian Institute of Toxicology Research, Lucknow**

**ILSI-India and ICMSF Conference on
“Current and Innovative Approaches to Microbiological Food Safety Management”
October 21-22, 2008; New Delhi, India**



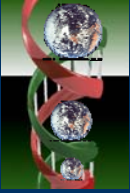
Why is Food Safety Important ?

- Food is expected to nourish people
- Unsafe food leads to foodborne diseases
predominantly induced by micro-organisms
- Some populations are highly vulnerable to
unsafe food



.....Food borne illness

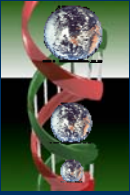
- **Foodborne illnesses are defined as diseases, usually either infectious or toxic in nature, caused by agents that enter the body through the ingestion of food.**
- **Every person is at risk of foodborne illness.**



Foodborne illness

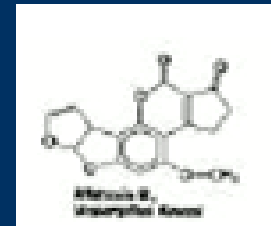
- 76 million cases each year
- 350,000 Hospitalizations
- 5000 Deaths

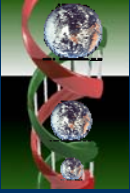
According to the World Health Organization (WHO) about 70% of the 2 million death per year from diarrhea in developing countries are related to contaminated food.



Sources of Food hazards

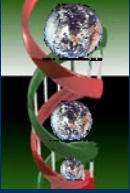
- **Biological:** bacteria, viruses, parasites
- **Chemical:** naturally present chemicals, chemicals produced by cooking, (environmental) contaminants, additives, cleaning chemicals
- **Physical:** foreign objects, e.g. bone, rock, metal





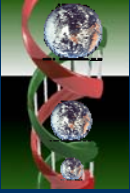
.... Sources of Food hazards

- **Air**
- **Dust**
- **People**
- **Food Contact Surfaces**
- **Equipments**
- **Insects, Animals**



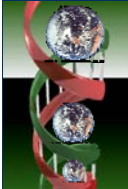
Environmental Contaminants

- **Methylmercury**
- **PBB**
- **PCB**
- **Insecticides and Pesticides**



Natural Toxicants

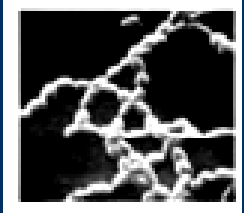
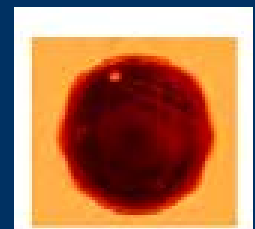
- **Poisonous mushrooms**
- **Goitrogens**
- **Cyanogens**
- **Solanine**

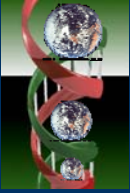


Microorganisms are the Enemy

➤ Microorganisms are the root cause of quality and safety problems

A ton of microscopic bacteria may be active in each acre of soil

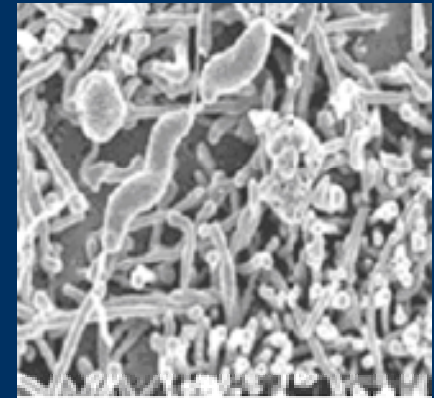




Common causes of Foodborne Infections

➤ *Campylobacter jejuni*

- Sources: raw poultry, unpasteurized milk
- Symptoms:
Diarrhea, nausea, vomiting,
may last 7-10 days

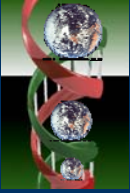


Common causes of Foodborne Infections

➤ Listeria-

- Sources: raw milk, raw seafood, soft cheeses
- Symptoms: 7-30 day onset; miscarriage, sepsis, meningitis

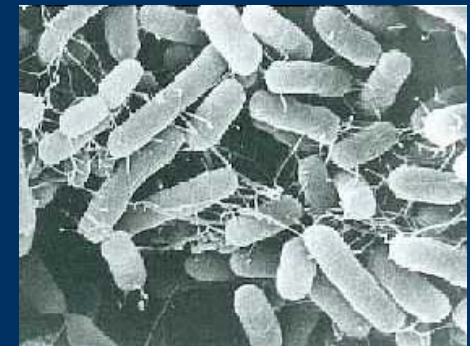


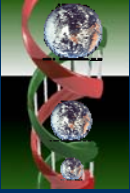


Common Causes of Foodborne Infections

➤ Salmonella

- Sources: raw or undercooked poultry, eggs...
- Symptoms: 6-48 hr onset; fever, chills, vomiting, abdominal cramps, diarrhea

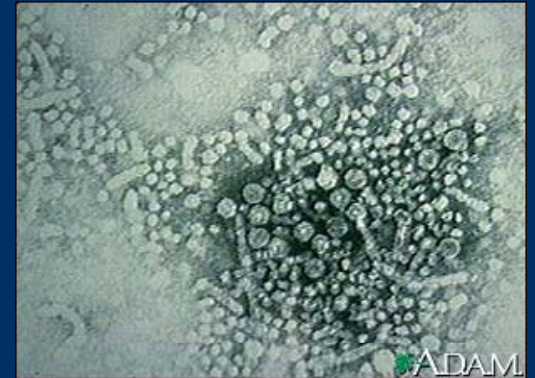


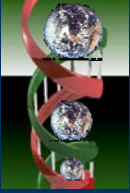


Common Causes of Foodborne Infections

➤ Hepatitis A virus-

- Sources: Undercooked or raw shellfish, human contact
- Symptoms: 15-20 day onset; liver inflammation, tiredness, nausea and vomiting

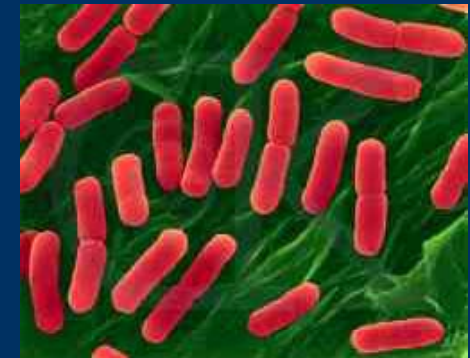




Common Causes of Foodborne Infections

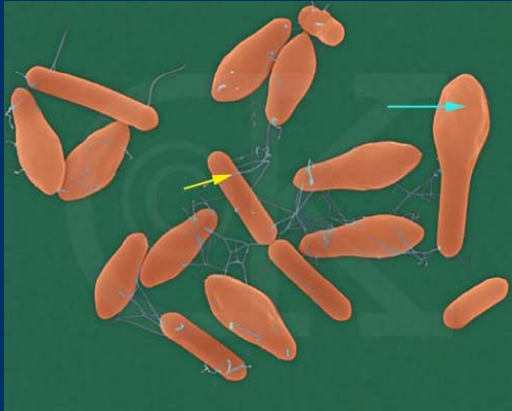
➤ *E. coli* O157:H7-

- Sources: Undercooked ground beef, Unpasteurized milk products, person to person.
- Symptoms: 12-72 hr onset; bloody diarrhea, kidney failure, can be fatal



Common causes of Food Intoxication

➤ C. Botulinum toxin:

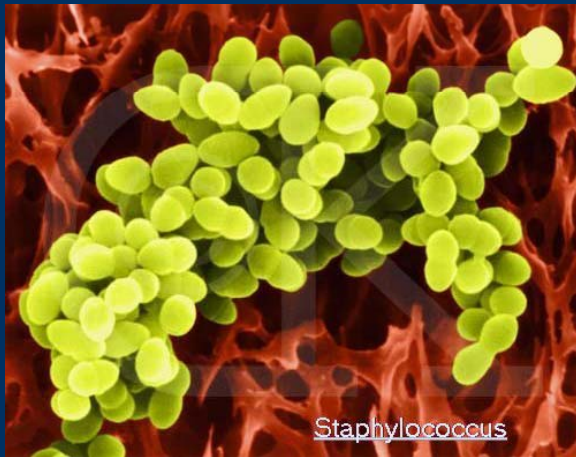


- Sources: improperly canned products
- Symptoms: 4-36 hours; inability to swallow, double vision, progressive paralysis and suffocation; often fatal

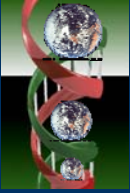


Common causes of Food Intoxication

➤ Staphylococcus:



- Sources: Humans are carriers; poor food handling procedures
- Symptoms: 8-24 hr. onset; mimics flu; lasts 24-48 hr; rarely fatal



Hormones and Drugs

➤ Growth Promoters

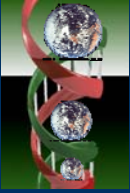
- Arsenals
- Antibiotics

➤ Milk Enhancers

- Oxitocin

➤ Drugs

- Antimicrobial (antibiotics, sulphonamides, etc)



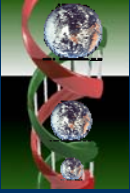
Adverse Effects

➤ Immediate

- Anaphylactic reaction
- Allergy

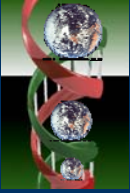
➤ Delayed Effect

- Drug Resistance
- Therapy Failure
- Impair on Immune System



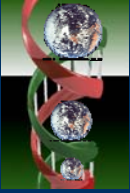
Unusual Issues

- **Mad Cow Disease**
- **Bird Flu**
- **Obesity**



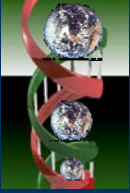
Selected Examples of Agents responsible for Food borne outbreaks in India

- **Bacteria:** Bacillus cereus, Escherichia coli, Staphylococcus aureus, Vibrio parahaemolyticus
- **Mycotoxins:** Aflatoxins, Clavine ergot alkaloids, Deoxynivalenol and Fumonisin
- **Naturally occurring toxins inherently present in Foods:** Unusual amino acids of Lathyrus sativus, Pyrrolizidine alkaloids of Crotalaria, Alkaloids in Argemone mexicana, Toxic proteins of Mushrooms
- **Chemical agents:** Heavy metal contaminants like Copper Arsenic, Mercury and Tin, unpermitted or improperly used Organochlorine and Organophosphorous Pesticide and Food Additives



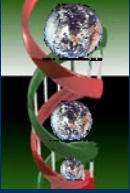
People with a higher risk of foodborne illness

- **Infants**
 - **Pregnant women**
- **Young children and older adults**
- **People with weakened immune systems and individuals with certain chronic diseases**



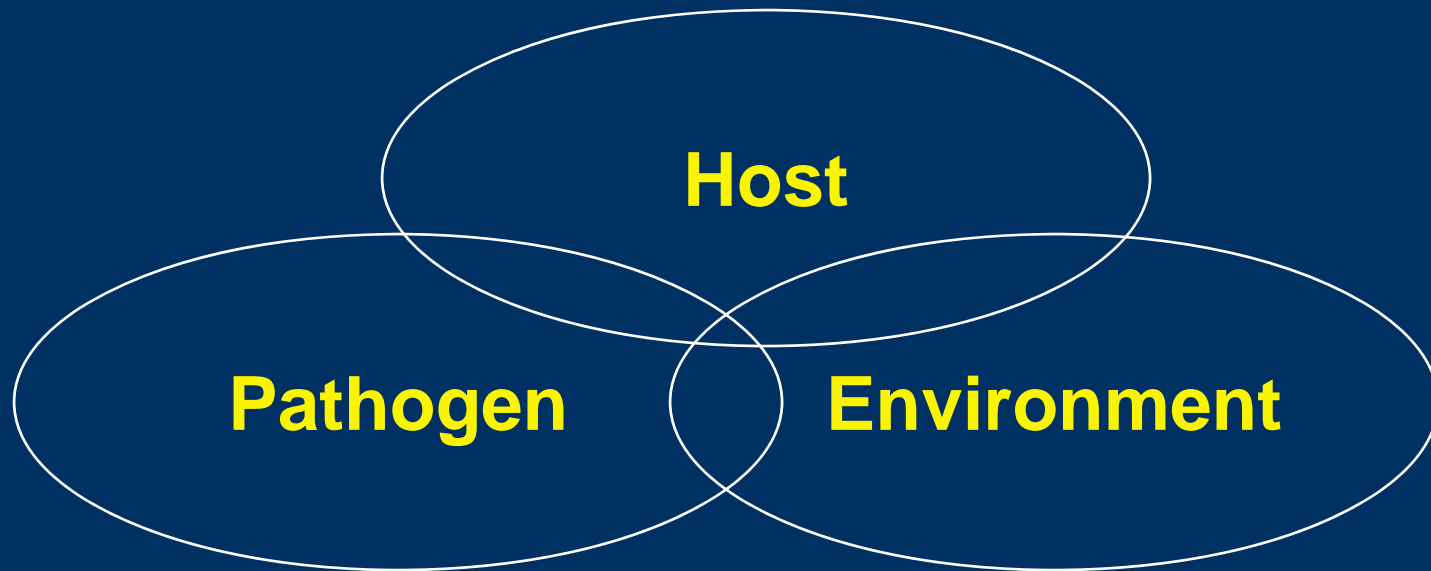
8 Identified Major Risk Factors

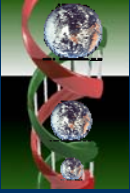
- Improper holding temperatures
- Preparing food ahead of planned schedule
- Poor personal hygiene
- Inadequate cooking
- Inadequate cleaning and disinfecting of equipment
- Cross contamination
- Use of left over
- Contaminated raw material



Challenge to Food Safety

Evolution and Change





Changing Times

19th Century

Emphasis on staples

Food security

Food adulteration

20th Century

Traditional recipes using locally produced food

Consumers - knowledge of food benefits limited

Eat to sustain body function and enjoyment

Protect public from food likely to cause illness or death

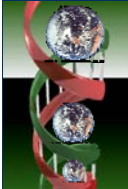
21st Century

Global food supply – exotic and unfamiliar foods

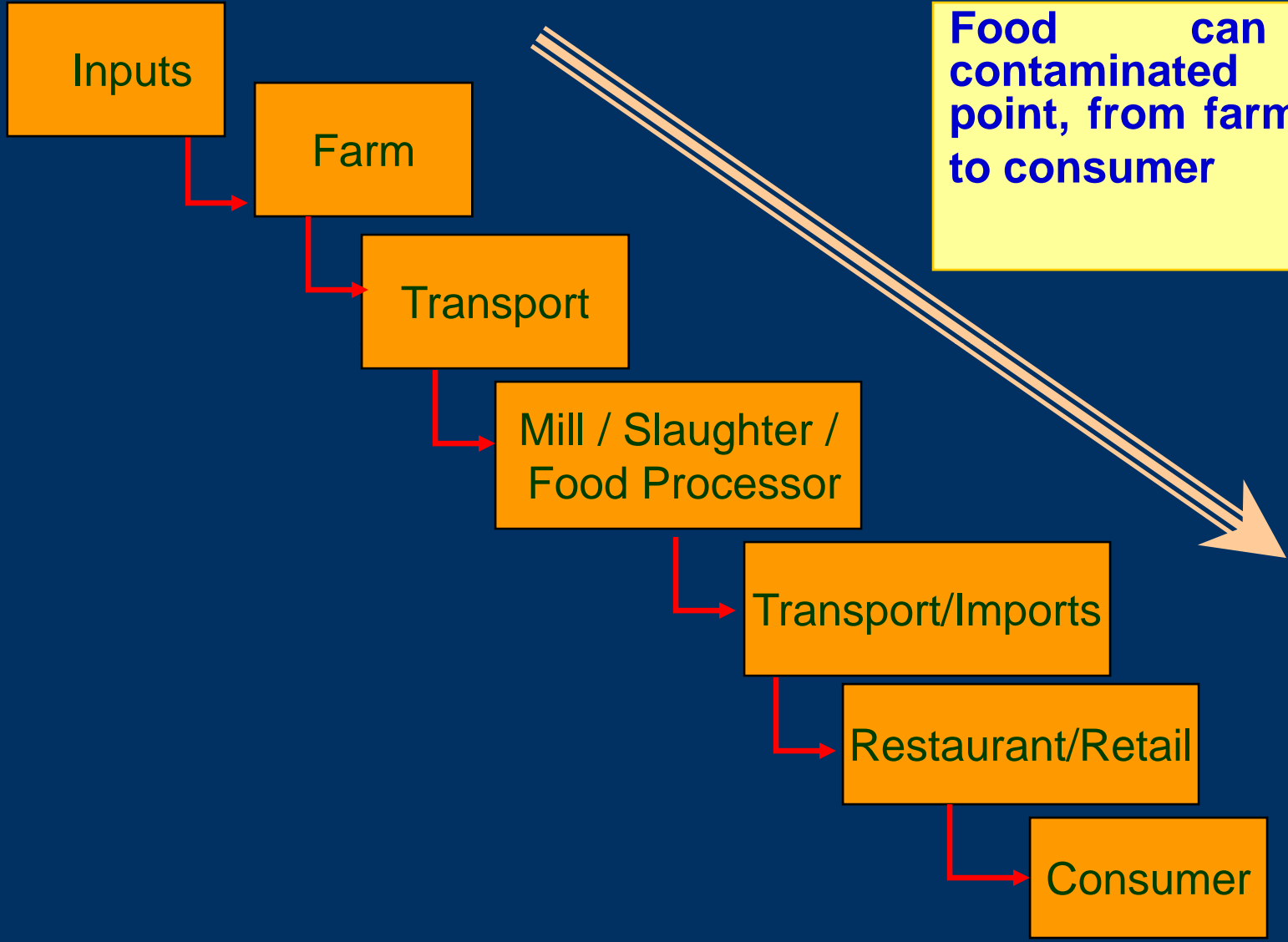
Processed foods – complex products and ingredients

Consumers more aware of link between diet and health and eat to enhance health and quality of life

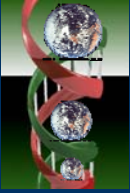
Demand for regulated safe food and information



Food Production is a Complex System



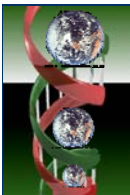
Food can be contaminated at any point, from farm inputs to consumer



Food Safety Challenges

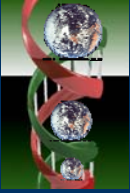
- Do we know all types of pathogens and chemicals causing food safety hazards?
- Identification of emerging food hazards and contaminants
- Development, validation and application of innovative methods for detection and control of pathogens and chemicals responsible for food-borne illness.
- Risk assessment and risk management in food safety
- What is the most cost-effective point to intervene in the food supply chain?

All these are quite challenging because we are dealing with moving targets. Pathogens are living organisms; they react to changing environments and mutation occurs in these organisms on a regular basis.



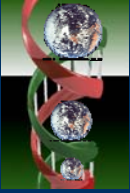
Special Issues for Developing Countries

- Importance of food safety recognition recently
- Little Consumer awareness
- Fragmented industry
- Majority of food processing units in small and unorganized sector
- Food handlers not well trained
- Diversity of food products / cuisines and food habits
- Inadequate laboratory and testing infrastructure
- Traditional practices like street food, carrying and storage food, etc.



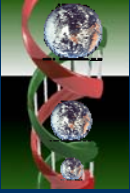
Food Safety Opportunities

- **Enhanced food safety in the country should provide opportunities for additional value-added agri-food exports**
- **Food safety is no longer a national issue. It will become an increasingly important global issue. India can play an important role in enhancing food safety capacities of developing countries which in turn will bring additional benefits.**
- **The food safety programs offer opportunities for human capital formation through food safety education and training.**



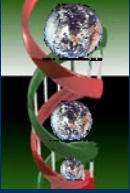
Some International Organisations

- **World Trade Organization (WTO)**
- **International Standards Organization (ISO)**
- **Codex Alimentarius Commission (Codex)**
- **Office International des Epizooties (OIE)**
- **International Plant Protection Convention (IPPC)**



Governmental Agencies in India

- **Grading, Certification and Inspection measures such as those under AGMARK, BIS, FPO, MMPO, EIC**
- **Developmental activities of agencies like APEDA, MPEDA, Ministry of Food Processing Industries**
- **Commodity Boards such as those for Coffee, Tea, Coconut, Bee (Honey), Horticulture, Dairy, Tropical produce (TRIFED).**



Regulatory Framework in India

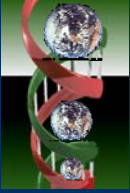
- 1. Government Rules for GMOs**
- 2. Ministry of Health and Family Welfare**
- 3. Prevention of Food Adulteration Act**
- 4. Task Force on Application of Agricultural Biotechnology**
- 5. National Biotechnology Strategy**
- 6. Food Safety and Standards Bill, 2006**
- 7. Food Safety and Standards Authority of India**



Objectives of Food Control System

Food Control System covering safety and quality of food should have the following broad objectives:

- **Protection of the consumer against health hazards and commercial fraud due to adulteration and misinformation – the core objective;**
- **Developing and protecting the system for production and distribution of safe food in the interest of national economy;**
- **Facilitation of domestic and export food trade.**
- **Communication of food risks to consumer and those engaged in post-harvest handling and distribution of food.**
- **Prevention of food hazards.**



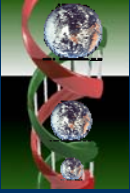
Conclusion

- There is significant concern and awareness about the food safety in India.
- A Food Safety and Standards Bill, 2006 has been introduced to regulate the sector and a Food Safety and Standards Authority of India has been setup under the Ministry of Health and Family Welfare.
- A number of new tools for risk assessment and tracking of the contaminants and the source of the food are being developed. These include early methods for detection, identification and softwares, etc



..... Conclusion

- **Problems of the food material being procured from Mandi's and street corners needs further attention as it is difficult to trace back the origin of food material from such places.**
- **There is a strong need of collaboration between food industry, academia and regulatory authorities to setup a comprehensive food safety system in the country to enable the country to compete qualitatively in the international food market.**



BIOTECH PARK, LUCKNOW

Chief Executive Officer

Biotechnology Park

Sector G, Kursi Road, Jankipuram

Lucknow-226021

Tel: +91-522-4012091 / 76 / 83; 2355050

Telefax: +91-522-4012081

Email: info@biotechcitylucknow.org

ceo.biotech@gmail.com