Food Safety Infrastructure

Dr. Deepa Bhajekar
Managing Director
MicroChem - **Silliker**

THE TRENDS

- We are what we eat……
- What we eat is changing….
- What we ate as fresh is now being packaged…
- What was packaged now has to stay good for 2 years….

- Mans needs today are changing…

SAFE FOOD

A SAFE FOOD may be defined as :

"a product which is free of microbiological, chemical or physical hazards".

OR

"a product that does not cause illness or injury when consumed as intended".

Additionally absence of adulteration, decomposition and deceptive label claims

FOOD BORNE DISEASES ON THE INCREASE

Available statistics on the incidence of food borne diseases demonstrate that it is on increase worldwide.

QUALITY ASSURANCE

- **Food Quality**
  (nutritional content, health benefits, etc.)
- **Food Safety**
  (absence of pathogens, toxins, allergens)

The implementation of any Food Safety Program

begins with a single most important attribute -

ATTITUDE !!!

ASSESSMENT OF CURRENT INFRASTRUCTURE AND NATIONAL DEMANDS

- Food manufactured locally
- Consumption patterns and diet
- Food exported
- Food imported
- Current legislation
- Licensing rules
- Problems in implementation
- Quality specifications
- Current state of food manufacturing

TYPES OF CONTAMINATION

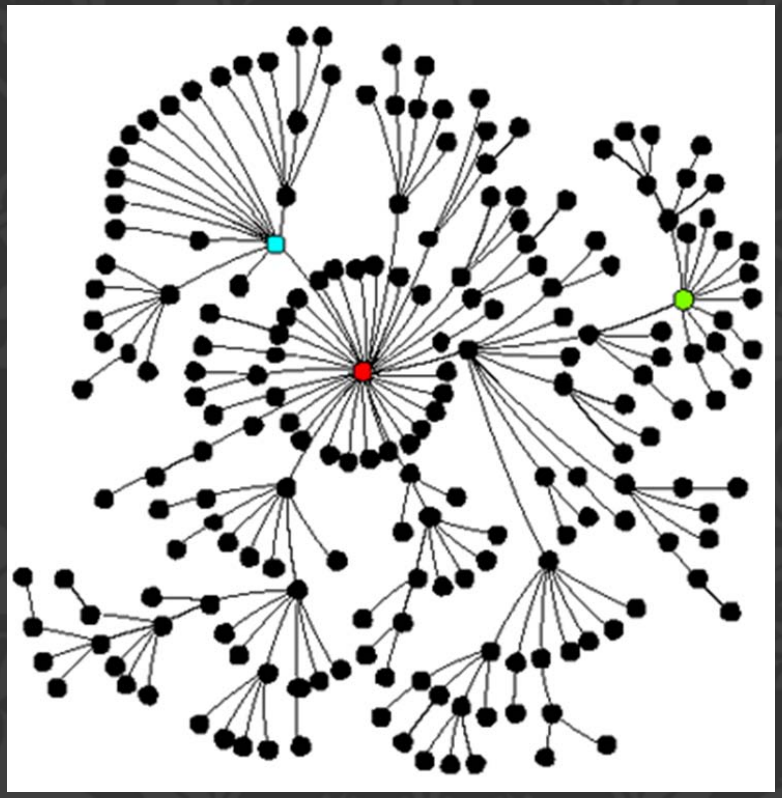
- **PHYSICAL**
  hair, pins, staples, glass pieces, bindis, stones
- **CHEMICAL**
  disinfectants, cleaning agents
- **MICROBIOLOGICAL**
  spoilage causing bacteria, yeasts and moulds

EARLY IDENTIFICATION, FAST DETECTION

SAMPLING OF FOOD AND LOGISTICS

- Sampling of food in sterile containers
- Transport to the lab in the shortest time period
- Training of samplers
- Quantity of samples drawn
- Storage of samples
- Analytical time
- Report review
- Documentation

ANALYSIS IS LIKE A WEB…..



GLP - DEFINITION

Set of principles that provides a framework within which laboratory studies are planned, performed, monitored, recorded, reported and archived. - ISO

GLP PRINCIPLES

- Lab Design and Infrastructure
- Qualified equipments
- Trained Manpower
- Selection of Suitable analytical methods
- Good Documentation

LABORATORY DESIGN & INFRASTRUCTURE

- Segregated lab for chemical, residue, micro labs
- Controlled Environmental conditions – Temperature / Humidity
- 24 X 7 power back up
- Good House keeping Practice.
- Safety Measures – Fire Alarm, Fire Extinguisher, Eye washer, Emergency shower, emergency exit…
- Epoxy coating – Microbiology lab

DOCUMENTATION

- Online documentation
- Entire analytical process to be traceable
- Starting from sample weighing
- .....reagent preparation
- .....purity of standard
- .....date of prep, date of expiry, Time/ date,
- .....log book entry, calibration of equipments calculation, verification

ARCHIVAL OF SAMPLES / DATAS

- Segregated Archival Room
- Date of receipt, date of analysis started, completed
- Date of disposal
- Regulatory conditions
- Perishable foods samples under refrigeration
- Retention time

MANPOWER

- Minimum Qualification B.Sc Chemistry/ B.Tech food science / technology
- Training
- Evaluation
- Authorization
- Periodical check / PT programmes
- QC Checks

CHOICE OF ANALYTICAL METHODS

- Standard methods published by AOAC, AACC, BIS, APHA, AOCS, ISO, EN, US FDA…
- Instrument related methods – In house validation – LOD/ LOQ
- Quality control Samples & Performance Check

- The important point to note is understanding the substrate matrix

EQUIPMENTS – FOOD TESTING

- **LC MS MS – To determine Pesticide residues, Melamine content, Sudan dyes, Penta chloro phenol, Aflatoxins, NOTs**

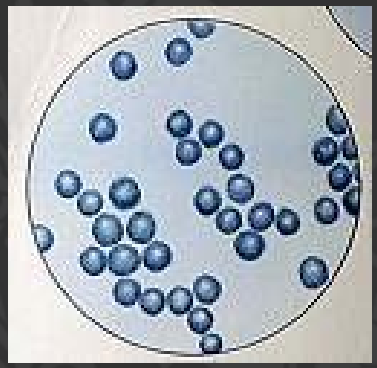
- **GC MS MS - Pesticide residue, Methyl mercury, Volatile organic compounds.**

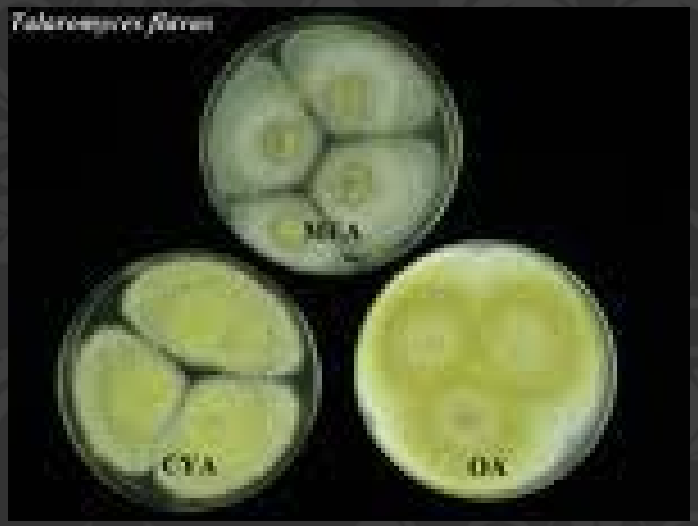
SPECIFIC EQUIPMENTS

- AAS / ICP MS- Determination of Trace metal analysis – Cadmium, Mercury, Arsenic, Lead, Tin
- Gas Chromatograph with ECD/FID – Fatty acid profile, Cholesterol, Residual solvent

EQUIPMENTS – FOOD APPLICATIONS

- HPLC – Vitamins – A, D2, D3, E, k1, K3 and Water soluble vitamins – B1, B2, B3, B6 , B9, B12, Food Additives- Benzoic acids, BHA, BHT, TBHQ etc..
- FTIR – Identification of compounds, Mineral oil
- HR GC MS – Dioxins
- Ion Chromatography – Amino acids, water analysis




MEA
CYA
OA

MICROBIOLOGICAL ANALYSIS IN FOOD

- Total Bacterial Count
- Anaerobic Spore Count
- Yeast & Mould
- Coliforms
- *Escherichia coli*
- Salmonella spp.
- *Shigella*
- *Pseudomonas aeruginosa*
- *Staphylococcus aureus*
- *Clostridium perfringens*
- *Clostridium botulinum*
- Faecal Streptococci
- *Bacillus cereus*
- *Bacillus subtilis*
- *Vibrio cholerae*
- *Vibrio parahaemolyticus*

CHEMICAL SAFETY - GLOBAL TRENDS AND ISSUES …

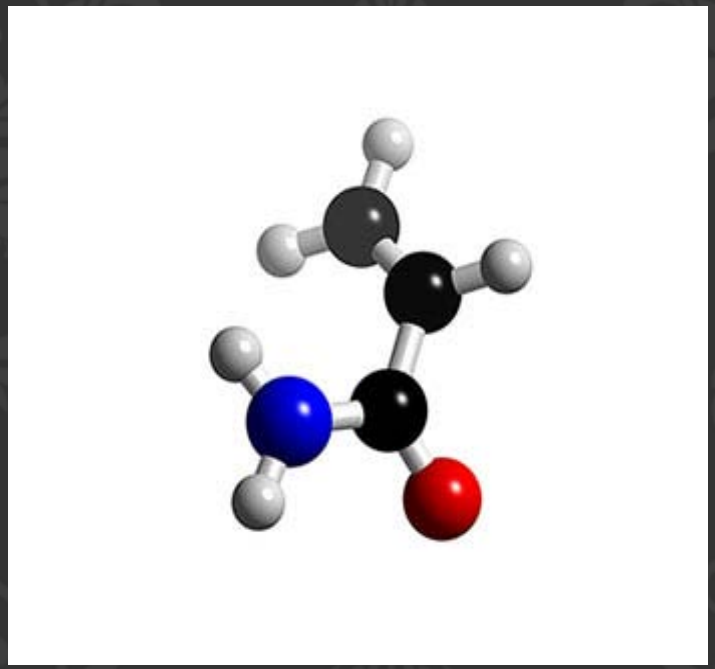
- Chemical Residues – Pesticide, antibiotics, drugs, Food additives, POPs, PAH, PCP, PCBs, Dioxins
- Adulterants – Unauthorized preservatives, colours, chemicals (melamine in dairy products)
- Food Contact Materials
- Toxic metals – Lead, Arsenic, Mercury, Cadmium
- Food Allergens
- Food Authentication

NUTRITIONAL ANALYSIS

- Calories
- Calories from fat
- Total fat
- Saturated fat
- Trans fat
- Cholesterol
- Sodium
- Total carbohydrates
- Dietary fibre
- Sugars
- Protein
- Vitamins
- Calcium
- Iron
- Minerals

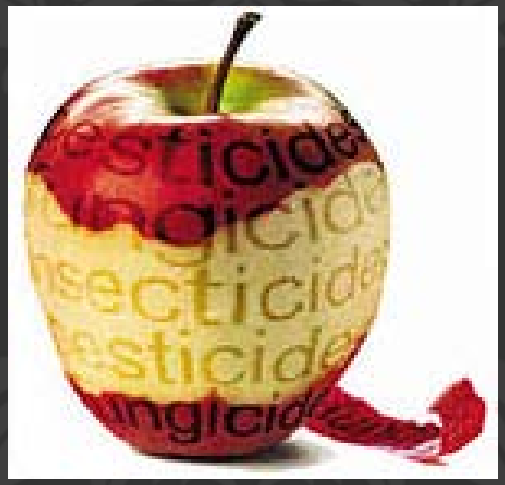
NEW-AGE CONTAMINANTS

- Acrylamide
- Benzene
- Dioxins and PCBs
- Ethyl Carbamate
- Nitrofuran
- Perchlorate
- Radionuclides



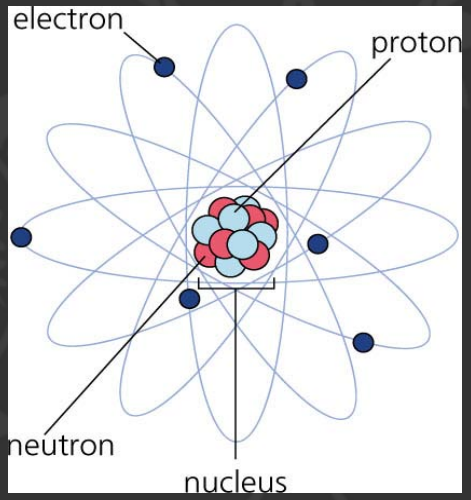
PESTICIDES

Tolerance limits for pesticide residues have been set by various regulatory authorities to protect us from harmful levels of pesticides in food.



COMMON TOXIC METAL CONTAMINANTS

- Lead
- Mercury
- Arsenic
- Cadmium
- Zinc
- Tin
- Chromium
- Nickel

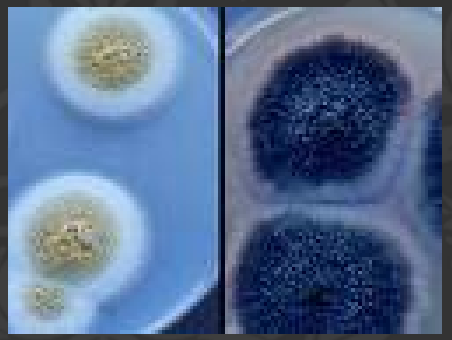


NATURALLY OCCURRING TOXINS (NOTS)

Not all toxins come from man-made sources. Many of these occur naturally are found in food plants, mushrooms, shell fish, etc.

EXOTOXINS AND MYCOTOXINS

- In addition to disease caused by direct bacterial infection, some foodborne illnesses are caused by Exotoxins which are excreted by the cell as the bacterium grows



- Mycotoxins are secondary metabolites produced by microfungi that are capable of causing disease and death in humans.

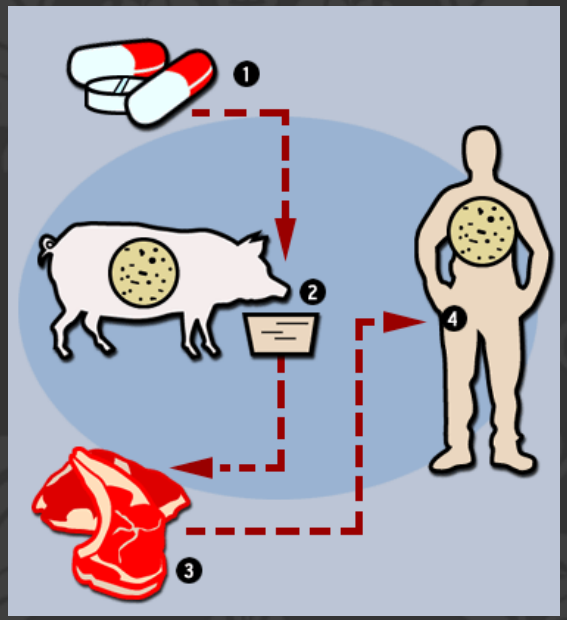
ALLERGENS

Some of the most common food allergens agents are :

- Milk
- Egg
- Peanuts
- Tree nut
- Seafood
- Shellfish
- Soy
- Wheat

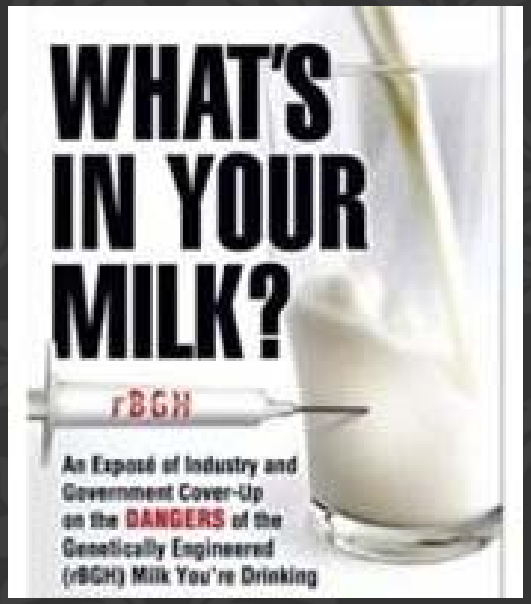
ANTIBIOTICS & VETERINARY DRUGS

Avoidance of antibiotic residues in food is essential in the production of safe products for human consumption



Hormones

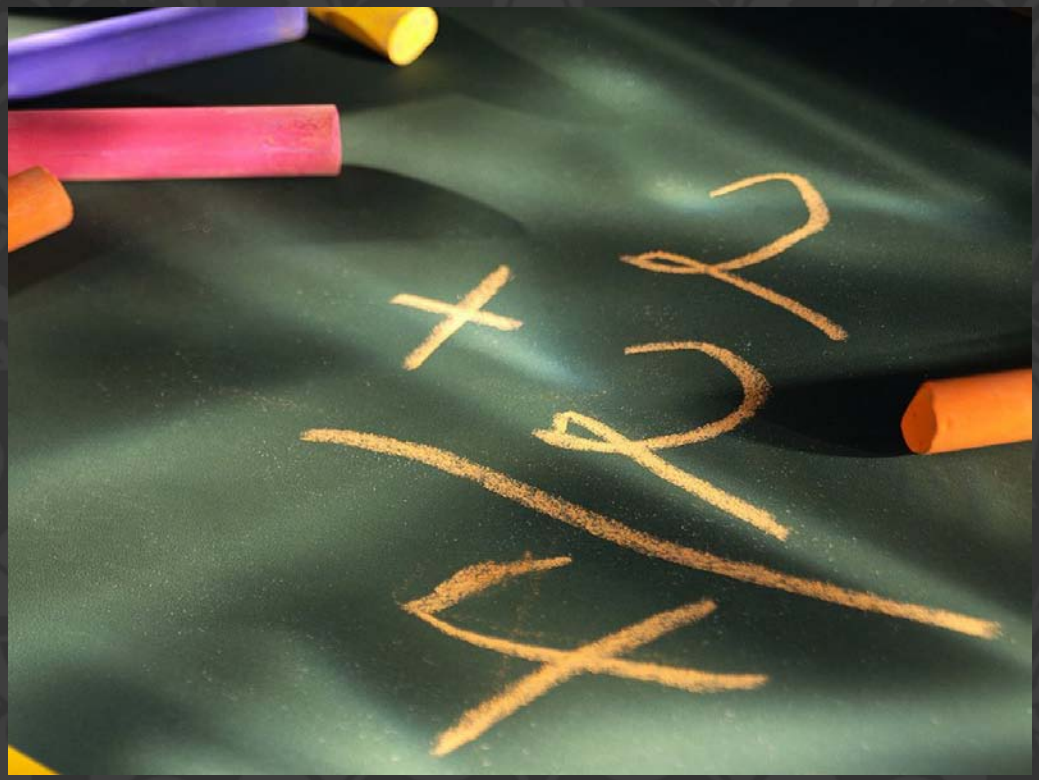
Hormones that are artificially administered to animals to increase growth, body mass or yield can be harmful to humans and their residual presence need to be ascertained.



Genetically Modified foods

Genetically Modified (GM) foods are produced from genetically modified organisms (GMO) which have had their genome altered through genetic engineering techniques

INTERPRETATION OF RESULTS



Thank You

Energizing Quality