

Meat Safety and Microbiology



MEAT SAFETY: CHEMICAL HAZARDS

PESTICIDE RESIDUE:

- ▶ Most pesticides are acutely toxic to humans and animals, even ingestion of low levels over long time have adverse effects
- ▶ FSIS is responsible for meat and poultry products

Various pesticides based on organism that is to be eliminated or controlled

INSECTICIDES:

- ▶ Carbamates- Used to determine both degree of toxicity and potential use. In recent years, it has not been considered a problem in meat products
- ▶ Organohalides- They are neurotoxins and noted especially for persistence in environment. They cause potential teratogenicity, endocrine disruption and carcinogenicity. Eg: aldrin, endrin



- ▶ Organophosphates- Used on wide variety of food animals like poultry and cattle. Chlorinated organophosphates are strictly regulated
- ▶ Synthetic pyrethroids- It is neurotoxic to insects. They are of low toxicity to humans and animals. They do cause burning type of skin

HORMONE DISRUPTERS:

POLYCHLORINATED BIPHENYLS (PCBs):

- ▶ It constitutes group of industrial chemicals that have good stability to chemical and thermal breakdown and are non-flammable.
- ▶ Other than severe skin rash named cholracne, exposure has not been caused any problems in adults.
- ▶ High levels of PCBs developed liver disorders, fatigue, nausea and children had delayed neurological and cognitive functioning
- ▶ Tolerance- 0.2 to 2 ppm

POLYCHLORINATED DIBENZO-P-DIOXINS (PCDDs)

- ▶ Environmental contaminants that are fat soluble and chemically stable
- ▶ Source of exposure include industrial, municipal incinerators, combustion of leaded gasoline, diesel fuel and wood
- ▶ High toxicity and carcinogenicity in animal models
- ▶ Have hormone mimicking properties of PCB
- ▶ Disruption of reproductive system in developing foetus, endocrine like compounds immune system malfunction and neurological disorders
- ▶ 50-90% exposure originates from food

ANTIBIOTIC RESIDUES:

- ▶ Have wide variety of toxic effects including potential teratogenicity and mutagenicity
- ▶ Used more selectively for therapeutic and disease prevention measures
- ▶ Fed to animals in sub-therapeutic doses
- ▶ Occurrence of antibiotic resistant strains of pathogenic bacteria has become worldwide problem in treatment of infectious disease
- ▶ Restrict the use in animals of any antibiotics that are essential for treating bacterial infections in humans

CHEMICALS FROM PRODUCTION AND PROCESSING:

HETEROLYTIC AMINES:

- ▶ Tryptophan, phenylalanine, lysine and glutamic acid each can yield mutagenic heterocyclic amines when exposed to high temperatures of broiling
- ▶ A marked decrease in mutagenic activity is observed when meat is fried at lower temperature
- ▶ Surface of well-done charcoal-broiled steaks contains much higher levels of heterocyclic amines than that of broiled beef

POLYCYCLIC AROMATIC HYDROCARBONS:

- ▶ Pyrolytic products of burning fuel or organic compounds present in any type of smoke
- ▶ Found in foods like grilled, roasted, smoked fish and meats
- ▶ Cooking at high temperature which involves lipid, peptide, carbohydrate generates PAHs
- ▶ Cause mutations, immunosuppression and eventual carcinogenicity in some animal species

NITROSOMINES:

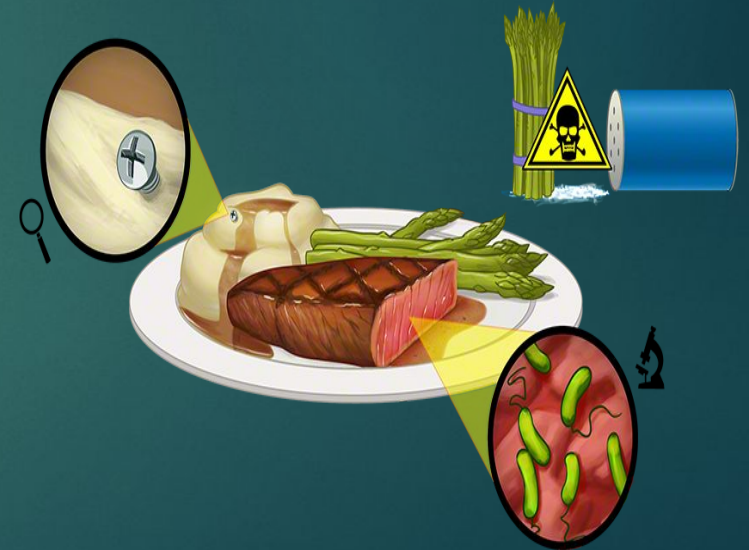
- ▶ N- Nitrosamines are carcinogenic compounds added to meat products
- ▶ Found in cheese, beer, dried milk, dried fish and mushroom
- ▶ Level of detection is 10 ppb

PHYSICAL HAZARDS:

It results from incoming raw material, poor personnel practices, faulty processes, facilities and equipment

Following list are the examples of physical hazards:

- ▶ Band-aids
- ▶ Bone fragments
- ▶ Carcass ID cards
- ▶ Dirt
- ▶ Rocks
- ▶ Wrapper
- ▶ Rubber
- ▶ Wood splinters
- ▶ Glass
- ▶ Gum





To help prevent and control physical hazards in processing facilities

- ▶ Using appropriate specifications for ingredients and supplies
- ▶ Identifying types and sources of physical hazards
- ▶ Training employees
- ▶ Utilising vendor certification
- ▶ Obtaining letters of guarantee from all supplies
- ▶ Equipment that detect/ remove physical hazards

BIOLOGICAL HAZARDS:

MICROBIOLOGICAL INTERVENTION STRATEGIES:

- ▶ Handling of carcasses:

To avoid bacterial contamination during slaughter and processing, carcasses should be chilled as soon as possible, sanitizing knives between animals, minimizing contact between hide and skinned carcass surface

- ▶ Decontamination by chlorine:

chlorine levels used ranged from 20-400 ppm and the effectiveness is influenced by temperature and pH of water.

- ▶ Decontamination by trimming:

Used to remove visible contaminants. It is very effective in removing bacteria, because organisms are removed physically from area, and counts after trimming becomes low

- ▶ Decontamination by miscellaneous methods:

It includes trisodium phosphate, ultraviolet radiation, post- exsanguination dehairing dry heat, ozone, have been used with various degrees of success



MEAT MICROBIOLOGY:

- ▶ Good sanitation of environment help reduce microbes on surface of animal before transportation to slaughter facilities
- ▶ During transportation, stress on animals also will influence shedding of organisms into transportation environment
- ▶ Sticking, bleeding operations will spread microorganisms onto and into various tissues
- ▶ Chilling, storing, aging, cutting, packing, transportation, distributing, handling, selling of meat and meat products contribute to further contamination of meat
- ▶ Improper time and temperature of food preparation may not render the meat safe for consumption

MEAT ASSOCIATED BACTERIA:

Bacteria found in meat are

- ▶ Pathogenic microorganism: Eg- Brucella, Salmonella, Streptococcus
- ▶ Spoilage microorganism: Eg- Achromabacter, Pseudomonas, Bacillus, Staphylococcus
- ▶ Molds: Eg- Aspergillus, Mucor, Penicillium

Bacteria count on meat of 0-2 log CFU/g - low

3-4 log CFU/g - intermediate

5-6 log CFU/g - high

7 log CFU/g - index of spoilage

8 log CFU/g - odour

9 log CFU/g – slime will appear

MEAT ASSOCIATED FUNGI:

- ▶ Carcasses aged at very low temperature can have surface defects caused by moles.
Eg: black, white, blue green and whisker spots
- ▶ Black spots- *Cladosporium cladosporioides* , *Cladosporium herbarum*
- ▶ White spots- *Chrysosporium pannorum* and *Acremonium* species
- ▶ Blue green spots- *Penicillium corylophilum*
- ▶ Whisker spots- *Thamnidium elegans* and *Mucor racemosus*

MEAT ASSOCIATED YEAST:

- ▶ Psychotrophic yeast are capable of growing on meats during refrigerated storage
- ▶ Yeast are unable to compete with bacteria in fresh meat
- ▶ Candida species are predominant yeast isolated from raw meat

MEAT ASSOCIATED PARASITES:

PARASITE	GENUS	MEAT
Protozoa	Taxoplasma	Beef, Pork, Sheep, Goat
	Sarcoystis	Beef
Flatworms	Fasciola	Beef liver
Tapeworms	Taenia	Beef, Pork
Roundworms	Trichinella	Pork



THANK YOU

