Introduction to HACCP

(Hazards Analysis Critical Control Point)

HACCP

- Food safety in the early twenty-first century is an international challenge requiring close cooperation between countries in agreeing standards and in setting up transnational surveillance systems.

- The behavior of consumers has been gradually changing. They currently require not only much higher dietary quality, hygiene and health standards in the products they purchase, but they also look for certification and reassurance of products' origins (national or geographical) and production methods.

History of HACCP

- Hazard Analysis and Critical Control Point (HACCP) was developed in the 1960s in the United States to ensure food safety for the first manned National Aeronautics and Space Administration space missions (NASA).
- NASA required a ‘zero defect’ program to guarantee safety in the foods astronauts consumed in space.

- Since then, HACCP principles have been defined and endorsed in international food standards (Codex Alimentarius Commission), and in European and UK legislation.
  Indonesia → SNI 1998
- Pillsbury presented the HACCP system at a national food protection conference in 1971

Chronology of Development of HACCP as a Safety System in the Food Industry

- **1959**. The Pillsbury Company develops concept for NASA.
- **1971**. HACCP, as we presently know it, took form at the US National Conference on Food Protection, where risk assessment was combined with the critical point concept (1st mention of HACCP).
- **1972**. The Pillsbury Company in the United States began the application of its HACCP concept to the manufacture of its consumer food products. Pillsbury published the first comprehensive treatise on HACCP in 1973.

- **1973**. An HACCP system was adopted for the Low-Acid Canned Food Regulations following the Bon Vivant Vichyssoise Soup botulism incident, in which several people died after eating the soup, due to botulism poisoning.
- **1980.** WHO/ICMSF report on HACCP.
- **1983** WHO Europe recommends HACCP.
- **1985**. The Food and Nutrition Board of the National Research Council/National Academy of Science published two books recommending that HACCP be used as a product safety system to ensure the production of safe food and for the broad application to various categories of non-canned food.

- **1989**. The U.S. National Advisory Committee on Microbiological Criteria for Food (NACMCF) developed and approved a standardized and updated HACCP system, endorsed by federal regulatory agencies responsible for food safety.
- **1990s**. The United Nations Codex Alimentarius Commission Food Hygiene standard embraced HACCP as an internationally accepted method for ensuring food safety by identifying hazards and monitoring their Critical Control Points in the process.
- **1997**. Codex Document on HACCP principles and application

- **1997 December**. FDA's Seafood HAACP program becomes mandatory.
- **1998**. FAO/WHO provide guidance for regulatory assessment of HACCP
- **1998 January**. HACCP becomes mandatory for large meat and poultry manufacturers.
- **1999 January**. HACCP becomes mandatory for small meat and poultry manufacturers.
- **1999 May**. A voluntary pilot study to test the implementation, evaluation, monitoring, and enforcement of the proposed National Conference of Interstate Milk Shipment HACCP program.

- **1999 September**. HACCP becomes mandatory for frozen dessert manufacturers in the state of Ohio.
- **2000 January**. HACCP becomes mandatory for very small meat and poultry manufacturers.
- **2002 January**. The juice HACCP regulation begins to be mandatory for processors, small businesses, and very small businesses.
- **2003**. FAO/WHO develop HACCP guidelines.
- **2004**. EC 852/2004 requirement for all food businesses to adopt HACCP principles in EU.

- **2006**. Legal requirements to apply HACCP in food businesses (other than primary production) across EU
- **2006+**. Increased worldwide use of HACCP in food safety legislation

- The HACCP system has grown to become the universally accepted method for food safety assurance.

WHY ???

The need for an effective food safety assurance method

- Foodborne disease are a widespread public health problem
- Emergence of foodborne disease
- Increased knowledge and awareness of the serious and chronic health effects
- New food technologies and processing methods
- Increased awareness of the economic consequences of foodborne disease

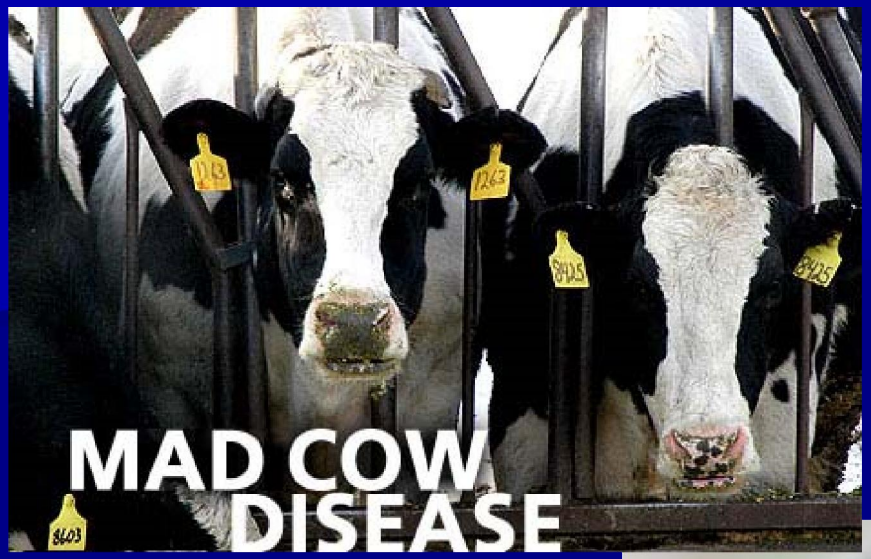

MAD COW
DISEASE

TABLE. Incidence* of cases of bacterial and parasitic infections and post-diarrheal hemolytic uremic syndrome (HUS), by year and pathogen, compared with national health objectives† - Foodborne Diseases Active Surveillance Network, United States

Pathogen	Year												National health objective†
	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	
Bacteria													
Campylobacter	23.59	24.55	19.42	14.82	15.37	13.61	13.34	12.58	12.77	12.65	12.68	12.79	12.30
Listeria	0.46	0.47	0.55	0.46	0.34	0.27	0.26	0.33	0.27	0.30	0.31	0.27	0.24
Salmonella	14.46	13.55	13.61	16.07	14.08	15.01	16.20	14.41	14.60	14.47	14.70	14.92	6.80
Shigella	8.89	7.87	7.14	3.74	7.67	6.36	10.84	7.25	5.05	4.66	6.08	6.26	N/A§
STEC¶O157	2.62	2.09	2.37	1.94	2.03	1.55	1.69	1.06	0.90	1.05	1.30	1.20	1.00
STEC non-O157	-	-	-	-	0.12	0.17	0.09	0.11	0.25	0.28	0.47	0.57	N/A
Vibrio	0.15	0.32	0.24	0.19	0.18	0.23	0.27	0.26	0.28	0.27	0.34	0.24	N/A
Yersinia	1.03	0.86	0.87	0.63	0.43	0.41	0.45	0.39	0.40	0.36	0.36	0.36	N/A
Parasites													
Cryptosporidium	-	2.90	2.26	1.46	1.57	1.50	1.32	1.09	1.43	2.95	1.93	2.67	N/A
Cyclospora	-	0.31	0.04	0.05	0.06	0.08	0.10	0.03	0.03	0.14	0.09	0.03	N/A
HUS**	-	-	-	-	2.04	1.65	1.92	1.29	1.09	1.46	2.01	-	0.90
Surveillance population (millions)	14.30	16.10	20.70	25.90	30.60	34.90	38.00	41.90	44.50	45.00	45.50	45.50	

*Per 100,000 persons

†Healthy People 2010 objectives for incidence of *Campylobacter, Listeria, Salmonell*a, and Shiga toxin-producing *Escherichia col*i O157 infections for year 2010.

§Not applicable because no national health objective exists regarding infection with this pathogen

¶Shiga toxin-producing *Escherichia coli*.

**Incidence rate for post-diarrheal HUS in children aged <5 years; rate calculation is based on surveillance population aged <5 years in sites that conduct hospital discharge data review.

The need for an effective food safety assurance method

- Increase in the number of vulnerable people
- Industrialization and mass production
- Urbanization
- Changing lifestyle
- Increase tourism and international trade in foodstuffs
- Increase consumer awareness of food safety

HACCP Concept

ASSURING FOOD SAFETY

Emphasizing from end-product testing to preventive control of critical aspects of producing safe foods

- Identifying potential food safety problems
- Determining how and where these can be controlled or prevented
- Describing what to do and training the personnel
- Implementation and recording

- It is important to always remember that the establishment of effective HACCP programs involves primarily the application of good common sense and preventive considerations to address situations before they become problems.
- The emphasis is on prediction rather than reaction, on getting the process right initially rather than correcting it after problems have occurred.

“Farm-To-Table”

Assurance throughout the food chain

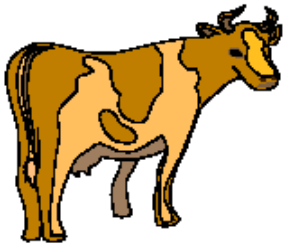
Stake holders involved in HACCP

Roles

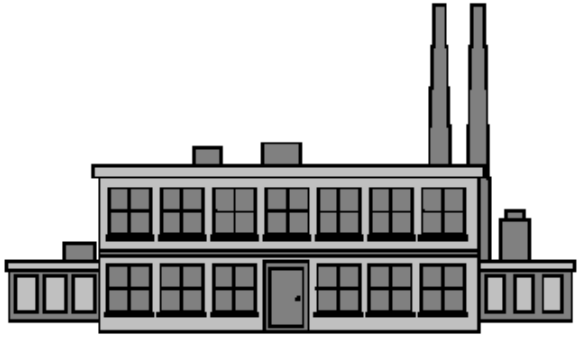
Government

Shared responsibility :

Farmers

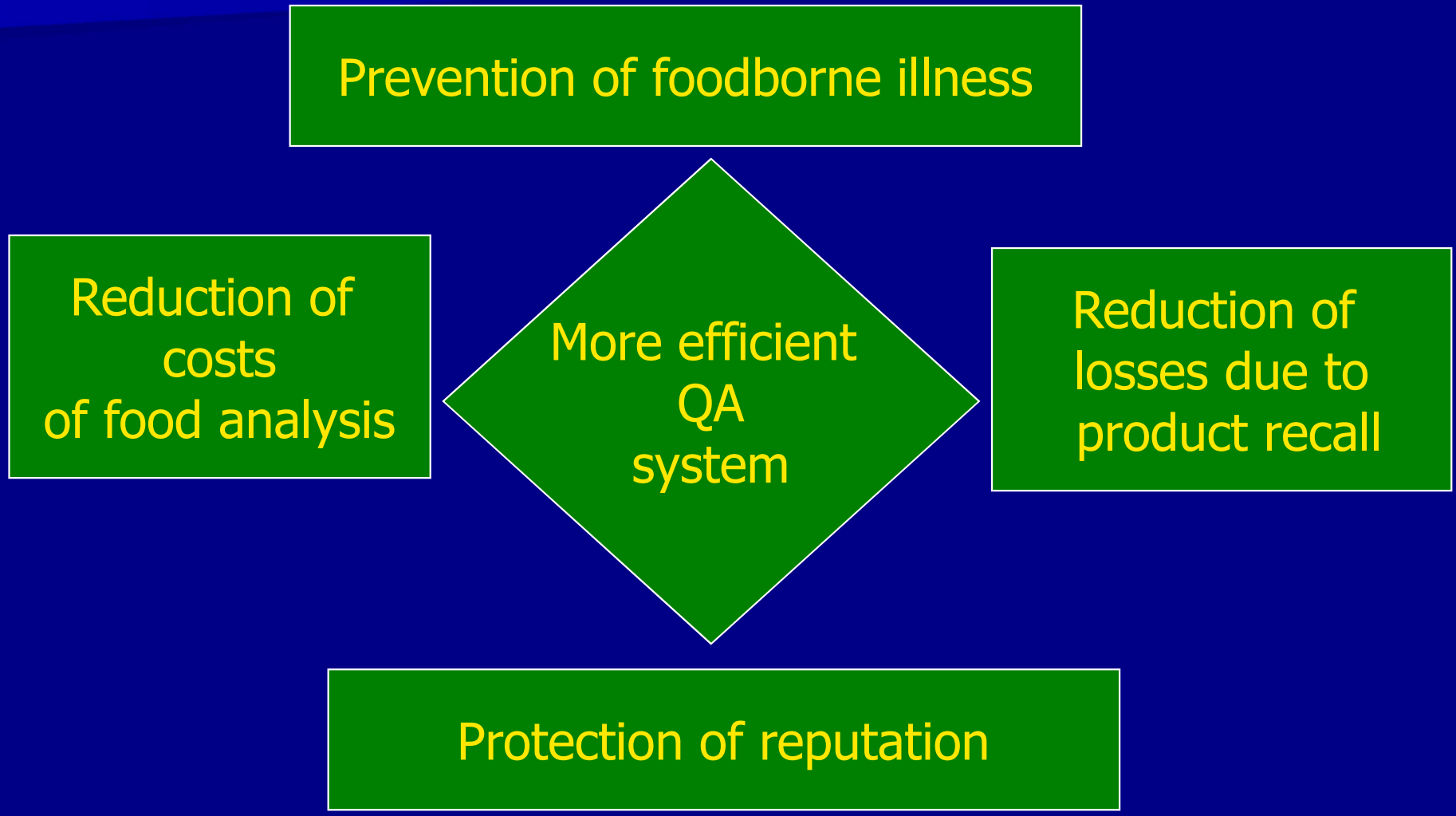


Manufacturers



Consumers

The objectives of application of the HACCP system



Other Advantageous

- Focuses on identifying and preventing hazards from contaminating food, based on sound science.
- Permits more efficient and effective government oversight, primarily because record keeping allows investigators to see how well a firm is complying with food safety laws over a period, rather than how well it is doing on any given day.
- Helps food companies to compete more effectively in the world market.
- Reduces barriers to international trade.

Guidelines for the application of HACCP system:

1. Assemble the HACCP team
2. Describe product
3. Identify intended use
4. Construct flow diagram
5. On-site verification of flow diagram
6. List all potential hazards, conduct a hazard analysis and determine control measures
7. Determine CCPs
8. Establish critical limits for each CCP
9. Establish a monitoring system for each CCP
10. Establish corrective actions
11. Establish verification procedures
12. Establish record keeping and documentation

The 7 principles of HACCP

1. Conduct a hazard analysis
2. Determine the CCPs
3. Establish critical limit(s)
4. Establish a monitoring system
5. Establish corrective actions
6. Establish verification procedures
7. Establish documentation

Source: CODEX

1. Assemble the HACCP Team

A multi-disciplinary HACCP Team needs to include knowledge of the following aspects :

- Raw Materials
- Specialist (Quality Assurance/technical)
- Operation activities
- Engineering/equipment technical knowledge of HACCP
- Process
- Finished product
- Hazard expertise
- Environment (premises, property, surroundings)

2. Describe the product

- Describe the product giving detail of its composition, physical/chemical structure, packaging, safety information, processing treatments, storage and method of distribution:

  - Product Name
  - Composition
  - End Product Characteristics
  - Method of Preservation
  - Packaging – Primary
  - Packaging – Shipping
  - Storage Conditions
  - Distribution Method
  - Shelf Life
  - Special Labeling
  - Customer Preparation

3. Identify the intended use

- Identify the intended use of the product, its target consumer with reference to sensitive population
- Five sensitive groups in the population
  - Elderly
  - Infants
  - Pregnant
  - Sick; and
  - Immunocompromised

4. Construct a process flow diagram

- Details of all process activities including inspections, transportation, storage and delays in the process
- Inputs into the process in terms of raw materials, packaging, water and chemicals
- Output from the process e.g. waste – packaging, raw materials, product-in-progress, rework and rejected products.

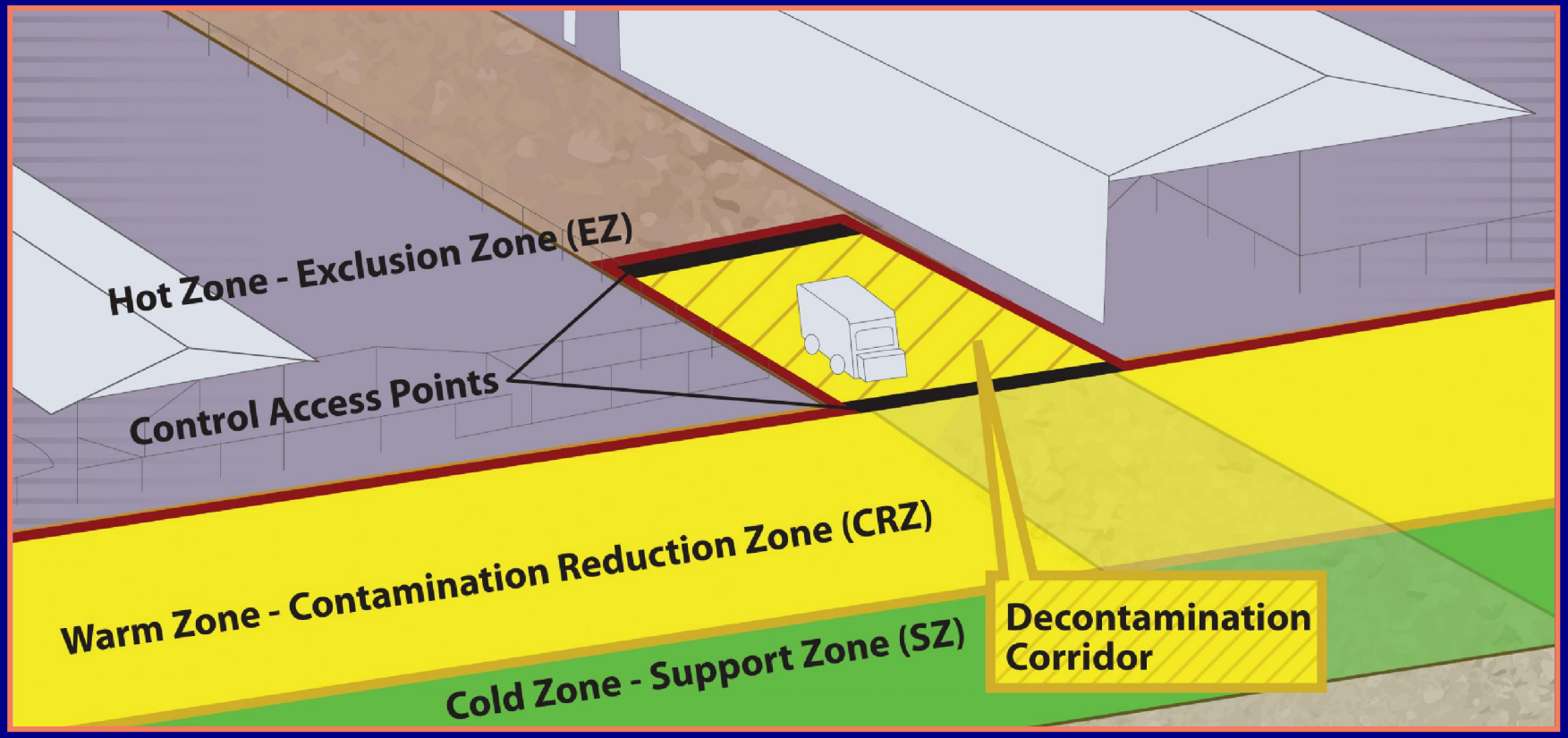
5. On site verification of the process flow diagram

- It should be done by all members of the HACCP team during all stages and hours of operation.

- Validate process flow diagram
  - By HACCP Team
  - Observe process flow
  - Sample activities
  - Interviews
  - Routine / non routine operations

Cleaning and Disinfection

Biosecurity Work Zones



Basic C&D Protocol

- Cleaning
  - Dry Cleaning
  - Washing
  - Rinse and dry
- Disinfection
  - Application
  - Contact Time
  - Rinse and dry
- Downtime

Preparation

- Turn fans off
- Disconnect electricity
- Remove sensitive equipment
- Alternative electrical supply for C&D equipment and lighting

Vectors

- To avoid transfer of pathogens
  - Detect and remove disease vectors
  - Seal rodent entrances
  - Remove and prohibit wild bird nesting areas
  - Eliminate insect breeding areas

Preparation

- Footbaths
  - Set up at entrance/exits
  - Ineffective if used incorrectly
    - False sense of security
    - Should not be sole process of disinfection
  - Use fresh solution
  - Allow contact time

Disinfectant Preparation

- Use according to product label
- Only EPA-registered or approved products
- Prepare fresh solutions
  - Old solutions may have reduced efficacy
- Test kits can help check concentration

Basic Protocol

- Systematic manner
  - Start at back and work toward front
  - Start at ceiling and work down walls
  - Small sections at a time
  - Work toward the drain
- Use marking tape to indicate completed areas

Dry Clean

- Use brooms, shovels, brushes, scrapers
- Moisten to control dust
- Remove
  - Visible organic material
  - Washable items
  - Rotten wood fixtures
- Scrape windowsills, floors
- Dispose of debris in biosecure manner

Wash and Rinse

- Wash area with detergent using sprayer, scrub brush
  - Avoid high pressure if highly contagious
- May need pre-soaked
- Scrubbing may be necessary
- Steam
  - Effective for cracks, crevices, pipework
- Rinse with clean, warm water
- Allow to dry overnight

Disinfection

- Apply EPA-registered disinfectant
  - Allow appropriate contact time
  - Must remain “wet”
  - Reapply if needed
- Rinse with clean, warm water
- Allow to air-dry

Building Interior

- Ensure C&D of interior components
  - Water dispensers, troughs, augers, fans
- Electrical equipment
  - Turned off first
  - Wipe clean, sanitize

Building Exterior

- Width will vary with pathogen
  - May be as wide as 10 feet
- Flame gun
  - Wet surfaces prior to distinguished areas treated
- Fan inlets
  - EPA-registered disinfectant with low pressure sprayer

Material Composition

- Concrete = porous
  - Difficult to clean
  - Registered product, flame gun
- Metal = easier to clean
  - Some products corrosive
  - Flame gun
- Wood = very porous
  - Discard if possible
- Soil, sand, clay
  - No environmentally safe product

Downtime

- Free of any animals or activity
- Reduces pathogens by drying
- Time varies based on pathogen
  - Three times expected incubation period
- Block of area

Slurry Pits

- Decontaminate by chemical process that alters the pH
  - Vigorous stirring
  - Maintain pH for several days
- Precautionary measures
  - Minimum of 2 personnel
  - Wear respirators, safety harnesses, lifeline
  - Area well ventilated due to toxic gases produced with agitation

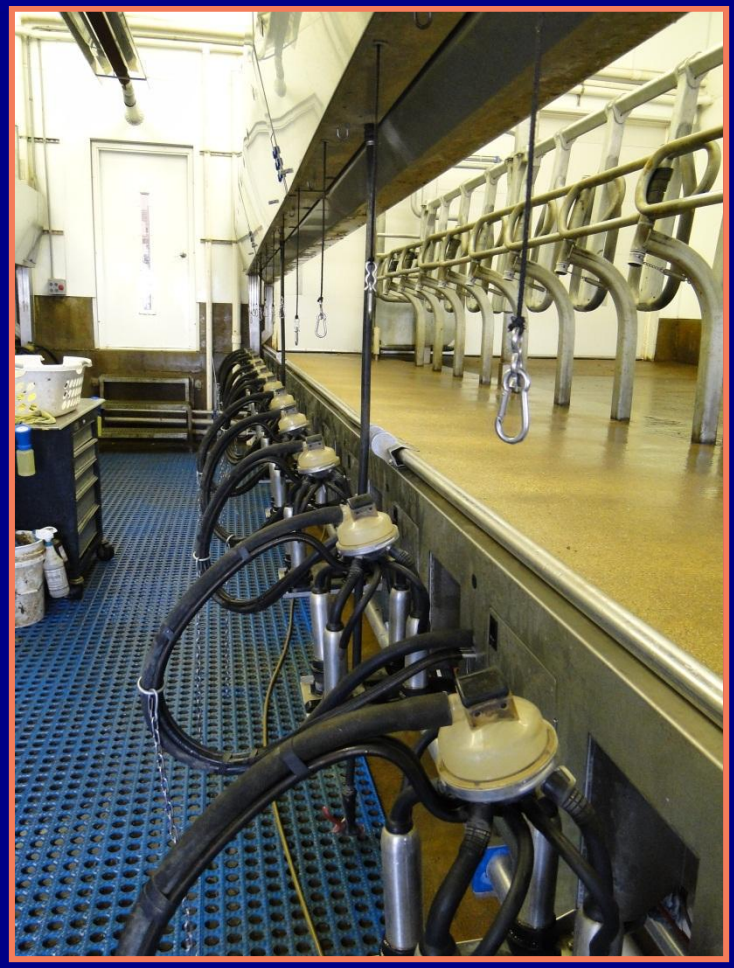
SPECİFİC PRODUCTİON SİTUATİONS

Poultry Premises

- Egg processing equipment
  - Egg belts, flats, buggies, packing machines
- Nesting boxes
- Egg storage rooms
- Open floor areas
- Curtains

Dairy Facilities

- Milking equipment
  - Milking units, strainers, coolers, bulk tank
  - Removal of milk-film or deposits
- Input from manager, personnel may be useful
- Products must specifically list milking equipment



Swine Facilities

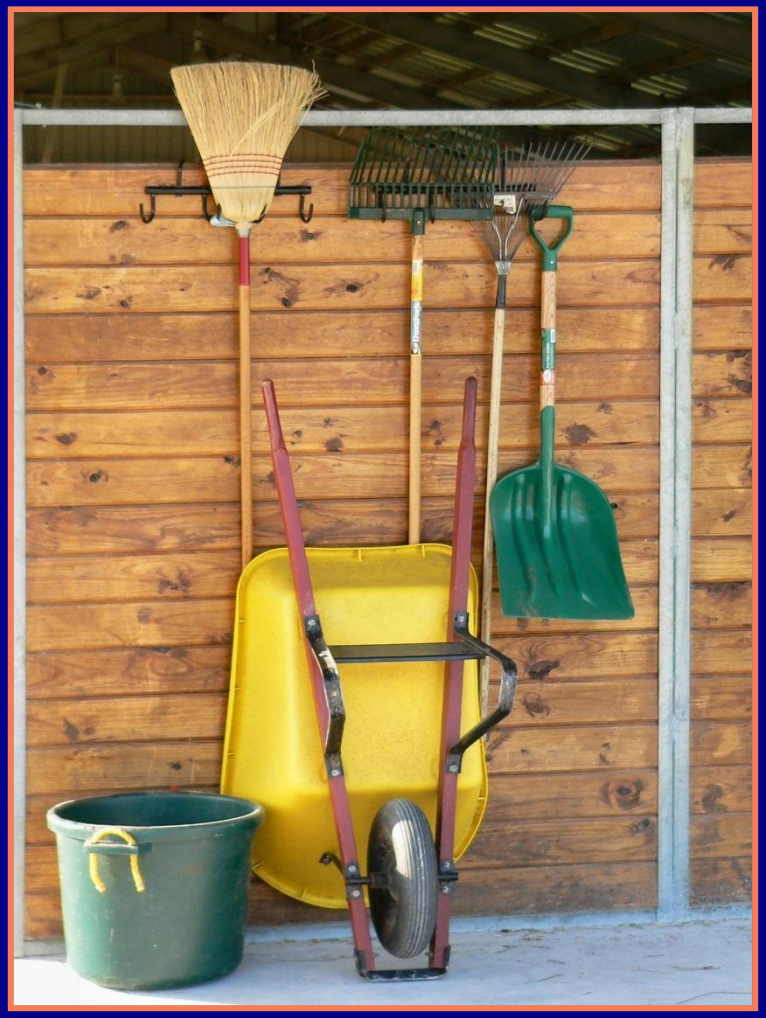
- Special items
  - Farrowing pens, slats, slurry alleys, pits
  - Electrical equipment
  - Bars, crates, gates
- Clean and disinfect without leaving residual chemicals
- Phenolic disinfectants should be avoided

Equine Facilities

- Equine facilities highly variable
  - Products labeled for wood, concrete should be applied once organic debris removed
  - Special attention to metal bars on stalls
  - Flame gun for non-flammable surfaces

C&D Equipment

- Equipment used for C&D procedures must also be either cleaned and disinfected before reuse or properly disposed of



Safety

- Chemical Hazards
  - Skin, eye, respiratory irritation
- Physical Hazards
  - Slips, trips, falls
  - High pressure sprayer

Environmental Hazards

- Runoff must be avoided
  - Infectious material
  - Chemical solution
- Toxic to aquatic organisms
- Further spread of pathogens

Evaluation

- Areas properly cleaned/disinfected
- Personnel aware of/implementing C&D measures
- Proper disinfectant selected
  - Appropriate concentration
  - Correct contact time achieved
- C&D Waste
  - Minimize or avoid environmental impact