Biological Hazards

Chapter 4: Biological Hazards and Controls
HACCP A Systematic Approach to Food Safety

OFFICE OF THE TEXAS STATE CHEMIST
Texas Food and Petroleum Control Service  Agriculture Analytical Service

Biological Hazards

- Types of food-borne disease can be classified as either infection or intoxications.
- Codex classifies feed biological hazards as:
  - Bacterial (Salmonella, Brucella)
  - Endoparasites (Toxoplasma and Taenia spp.)
  - Prions

Origin of HACCP

Development of foods for the space program.

NASA had two principal safety issues:

First, potential problems with food particles in zero gravity

Second, absolute assurance of freedom from pathogens and biological toxins

Food-borne diseases (CDC)

- In 1999
  - 76 million cases per year
  - 325,000 hospitalizations
  - 5,000 deaths

- Current Statistics by FDA
  - 48 million cases
  - 128,000 hospitalizations
  - 3,000 deaths

Zoonotic Diseases

- Diseases transmissible from animal to humans

Hazard Guide

A hazard guide is found in the back of Chapter 5 beginning on page 33. Elements include:

- Disease, symptoms and onset
- Source
- Transmission
- Characteristics of Microorganism
- Control

http://www.fda.gov/Food/ResourcesForYou/Consumers/ucm103263.htm
Zoonotic Pathogens in Feed

- Bacteria
  - *Salmonella spp*
  - *Brucella*
  - *Listeria monocytogenes*
- Endoparasites
  - *Toxoplasmosis*
  - *Taenia*
  - *Trichinella*
- BSE

Food-borne illness associated with animal feed

- Numerous examples of outbreaks of *Salmonella* infections in animals that were traced to contaminated feeds including cattle, pigs, chickens, turkeys, and mice.
- Although it is less well documented, bacteria that cause humans infections but may not cause illness in animals can also be readily transmitted to food animal via contaminated feed and appear on animal carcasses destined for human consumption.

Crump et al 2002

Guidance for FDA Staff

*Compliance Policy Guide*
Sec. 690.800 *Salmonella* in Food for Animals

This guidance represents the Food and Drug Administration’s (FDA’s) current thinking on this topic. It does not create or confer any right or legal status on any person and does not operate to bind FDA or the public. You can use an alternative approach if the approach satisfies the requirements of the applicable statutes and regulations. If you want to discuss an alternative approach, contact the FDA staff responsible for implementing this guidance. If you cannot identify the appropriate FDA staff, contact the Office of Regulatory Affairs at the address listed on the title page of this guidance.


Salmonella-Contaminated Animal Feed – Serotypes Pathogenic to Animals

The following are some examples of animal feeds and the pathogenic *Salmonella* serotypes that have been associated with disease in the particular animal species consuming these feeds:
- Poultry feed with *Salmonella Pullorum,* *Salmonella Gallinarum,* or *Salmonella Enteritidis*
- Swine feed with *Salmonella Cholera suis*
- Sheep feed with *Salmonella Abortusovis*
- Horse feed with *Salmonella Abortusequi*
- Dairy and beef feed(s) with *Salmonella Newport* or *Salmonella Dublin*

Investigation Update: Multistate Outbreak of Human *Salmonella Enteritidis* Infections Associated with Shell Eggs

- July 2010, CDC identified a nationwide sustained increase in the number of *Salmonella Enteritidis* isolates with PFGE pattern *JEGX01.0004*
- Wright County Egg in Iowa was found as the common source of the shell eggs associated with four of the clusters. Through traceback and FDA investigational findings, Hillendale Farms of Iowa, Inc., was identified as the source of the shell eggs.
- The feed was provided to pullets (young female chickens or hens) raised at Wright County Egg facilities in Iowa.

http://www.cdc.gov/salmonella/enteritidis/
Brucella

Brucella spp. are small, Gram-negative, short, non-sporoform coccobacilli. Members of the genus Brucella, of which there are six recognized species, belong to a class of Proteobacteria.

In countries where Brucella is endemic, pasture may be contaminated by ruminants which deliver or abort offspring there, because the placenta of infected animals contain high levels of these microorganisms. Milk-producing animals may become infected by eating forage from contaminated pastures and excrete the microorganisms in their milk. This milk may be a risk to human health if not pasteurized prior to use.

Listeriosis

Listeria

Listeriosis

Trichinellosis

Trichinellosis

Toxoplasmosis

Toxoplasmosis

Bovine Spongiform Encephalopathy (BSE)
Control Measures

- Conditioning temperature and time
- Application of microbial control agents
- Receiving (serological test)

Resistance of Bacteria

- Non-sporeformers
  - Sensitive to heat, chemicals, and other treatments
  - Examples:
    - Salmonella
    - L. monocytogenes
    - E.coli 0157:H7

- Sporeformers
  - Resistant to heat, chemicals, and other treatments
  - Examples
    - C. botulinum
    - C. perfringens

Summary

- HACCP originated as a part of the US space program and this effort focused on controlling the entire process of manufacturing food to eliminate biological hazards
- There are an estimated 48 million cases of food-borne disease annually in the US
- Hazard guides for many HACCP regulated products
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