Animal and Egg Production Food Safety

Egg Quality Assurance

Animal and Egg Production Food Safety

Egg Quality Assurance

Information about the egg quality assurance program was compiled from United Egg Producers, and the Pennsylvania and California Egg Quality Assurance Programs.

Learning Objectives

- To understand why egg quality assurance is important
- To understand some egg quality assurance programs that are in practice
- To understand the critical control points of an egg operation
- To become familiar with the best management practices of an egg operation

The Importance of Salmonella Control

Salmonella are part of a family of bacteria known as Enterobacteriacea which are found in intestinal tracts of humans and other animals.

Salmonella enteritidis (SE) is one of 2,300 types of Salmonella but one that is predominantly found in poultry products including fresh shell eggs and unpasteurized liquid eggs.

SE from feces can contaminate eggshells and hens with whole body infections can contaminate egg contents.

Egg Quality Assurance

- Voluntarily implement management and monitoring practices most likely to prevent *Salmonella enteriditis* contamination.
- Basic preventive measures include:
  - Placement of SE-free chicks,
  - Strict rodent control,
  - Effective biosecurity,
  - Cleaning and disinfecting between flocks, and
  - Environmental monitoring of pullet and layer houses with continuous testing of eggs from environmentally positive houses. Positive eggs are diverted for pasteurization.

United Egg Producers "5-Star" Food Safety Program

Designed to assist egg producers, egg processors, and egg marketers in establishing programs that will meet a set of guidelines for food safety, animal well-being, and the environment. The program includes husbandry guidelines and good ventilation and manure management programs.

United Egg Producers "5-Star" Food Safety Program

Identifies five critical points to be monitored:

1) poultry house cleaning and disinfecting,
2) rodent and pest elimination,
3) proper egg washing,
4) biosecurity, and
5) refrigeration.

California Egg Quality Assurance

- Purchasing chicks and pullets from hatcheries participating in the *Salmonella enteritidis* program;
- Transporting chicks and pullets in coops and trucks that are decontaminated between flocks;
- Obtaining feed from mills that follow accepted feed industry GMPs and the recommended Salmonella Control for Processors of Livestock and Poultry Feeds;
- Using animal protein ingredients originating from rendering plants participating in the APPI Salmonella Reduction Education Program;

California Egg Quality Assurance

- Administering medications, feed additives, and pesticides according to approved label directions;
- Maintaining an effective flock health program to include vaccinations, monitoring, and periodic necropsy of mortality or cull birds;
- Maintaining a farm rodent monitoring and reduction program;
- Cleaning and disinfecting pullet and layer buildings before restocking; and
- Utilizing a biosecurity plan and training employees on proper procedures to execute the program.

California Egg Quality Assurance

- Each participant designs an appropriate monitoring plan applicable to their specific operation.
- The program was developed by California egg producers, with the assistance of the California Department of Food and Agriculture, USDA, University of California Cooperative Extension Service, and the California Veterinary Diagnostic Laboratory System.

California Egg Quality Assurance

- The program also has egg processing plant guidelines:
  - Sanitation of facilities and equipment;
  - Adequate lighting to properly identify egg defects;
  - Potable water with less than 2 ppm of iron;
  - Wash water maintained at 90 degrees F or higher and at least 20 degrees F higher than the temperature of the eggs to be washed;
  - Use of USDA-approved cleaning compound in the wash water;
  - Wash water added continuously and replaced every four hours (more often if necessary);
  - Washed eggs spray-rinsed with warm water and a USDA-approved sanitizer; and
  - USDA guidelines followed if eggs are to be oiled.

Pennsylvania Egg Quality Assurance

- This program began in February 1994, using many of the same control procedures and testing protocols developed in an earlier Pilot Project.
- The program is a voluntary collaborative food safety assurance program incorporating on-farm microbiologic testing and risk reduction management practices to reduce *Salmonella enteritidis* contamination of shell eggs.

1995 Penna SE Pilot Study

- Hazards identified:
  - SE contaminated poultry houses
  - Rodents
  - Pullet chicks
- PEQAP emphasizes three Critical Control Points (CCPs)
  - Cleaning and disinfecting pullet and hen houses between flocks.
  - Rodent control
  - Placing SE-clean chicks in the pullet house

Biosecurity

Involves using all measures possible to control the spread of disease-causing organisms such as SE.

- Controlling human traffic
- Isolating poultry from contaminated equipment and animals
- Controlling insects and rodents
- Vaccination, disinfection, and good housekeeping

Biosecurity

Programs to prevent introduction of pathogenic bacteria into pullet and layer houses.

1 Day old chicks should be purchased from hatcheries participating in the Nat'l Poultry Improvement Plan (NPIP) "U.S. Sanitation Monitored Program".

2 Egg producers should require NPIP document Form 9-3 which certifies that the breeder flock is participating in the NPIP Program.

Biosecurity (cont'd)

3 Animal source feed ingredients should be monitored for *Salmonella enteritidis* from the supplier. The feed supplier should document animal protein source and active Quality Control Program.

4 The use of medications, feed additives, and pesticides should be used in compliance with instructions stated on the label. A label should be placed in the file for each medication or chemical used and the material should be described by trade name, active ingredient, use level, duration of use, and application method.

United Egg Producers

Monitor the Biosecurity Program

- Have all visitors sign a log book, indicating date, time, person's name, reason for visit, and names of other poultry farms visited before arriving at your farm. Keep all log books for at least 3 years.
- Have a 2nd sign-in sheet for each poultry house. It should request date, time, person's name, and reason for entering the building. File house sign-in sheets monthly and keep entries for at least 2 years.

BMPs for People

1. Make sure employees and family members wear freshly laundered clothing daily.
2. Have all visitors report to a central location and sign a log book before entering any building.
   - Do not allow anyone, including maintenance personnel and pest control people, to enter your poultry house or egg room unless they are wearing clean and sanitized coveralls, boots, and hat.
   - Clean and disinfect boots before entering and leaving each poultry house or have a separate pair of boots at each house. Manure is a major factor responsible for the spread of disease from one poultry house to another.
   - Change water in foot baths and add disinfectant at least daily.

BMPs for People (cont'd)

3 Always shower and change into clean clothes before leaving your farm and returning home.
   - Disease organisms can be picked up by visiting other farms, auctions, meetings, or restaurants where other farmers, service people, or backyard flock owners visit.

4 Try to limit each person's work schedule to one poultry house when possible.

5 Do not visit younger birds after visiting older birds except when younger birds are positive for SE and other diseases.

6 Keep all buildings locked at all times to ensure that your biosecurity plan is followed by all visitors.

PEQAP

BMPs for Equipment

- Borrow equipment from another farm only if it is thoroughly cleaned and disinfected.
- Restrict movement of all vehicles entering and leaving the farm. Have vehicles park outside the premises whenever possible.
- Bring onto the farm only clean and disinfected crates, egg cartons, etc. Reject anything that is not clean and notify the supplier of the problem.
- Do business only with companies that have high biosecurity standards.

PEQAP

BMPs for Animals

1. Avoid contact with wild birds and waterfowl.
2. Always place new birds in a clean and disinfected house.
3. Control rodents and insects inside and around poultry houses.
4. Properly dispose of dead birds in a timely fashion.
5. Make sure poultry houses are properly ventilated.
6. Keep manure as dry as possible.

CCP#1 Clean and Disinfect Between Flocks

Allow at least 2 weeks between flocks for cleaning, disinfecting, drying, and inspecting the house.

* Dry Clean
  - Remove all birds, eggs, and other live creatures including cats, wild birds, and rodents.
  - Thoroughly dry clean the house.
    - Clean inlets both inside and out using compressed air.
    - Clean manure off cage cross members and floor joists.
    - Clean fan housings, brush blades & louvers.
    - Remove all manure and debris from the pit.
    - Remove all mobile equipment from the house.
    - If particular areas have not been cleaned properly, reclean them prior to washing down.

CCP#1 Clean and Disinfect Between Flocks

* Wash down the house
  - Wet down all dirty areas and allow time to soak.
  - Wash all surfaces and equipment using high pressure.
  - Heat the house during winter wash-downs.
  - Give special attention to air inlets, both inside and outside.
  - Wash the upper portion of the house first and then the pit.
  - Push water out of the pit each day after washing.
  - Run feeders each day after washing and before washing the floors.
  - If particular areas have not been washed properly. Rewash those areas prior to disinfection.

CCP#1 Clean and Disinfect Between Flocks

* Disinfect
  - Apply disinfectants to all surfaces as a spray or foam, treating the upper portion of the house first and then the pit.
  - If particular areas have not been disinfected properly, disinfect again prior to culturing.
  - Clean the following by hand or using low pressure.
  - Designate a specific person to monitor the cleaning and disinfection and to keep and review records.
  - Culture the environment after cleaning and disinfection.
  - Reclean and disinfect specific areas if culturing suggest more effort is needed.
  - Once a new flock is placed, keep the house as clean as possible

Sanitizing, Disinfecting and Fumigation

- Apply disinfectants only after the house and equipment have been completely cleaned out.
  - Disinfectants are not effective on dirty surfaces.
  - Can be applied as a spray and as a fog.
- Fumigation may be used as a final disinfecting control program.
  - Gases penetrate surfaces that may not be reached by disinfectant sprayers
  - Fumigation should follow soon after the disinfecting procedures are completed
  - Require a relative humidity of at least 70% and a temperature of at least 70° F.

United Egg Producers

CCP#2 Rodent and Pest Elimination

Rodents and pests are possible carriers of bacteria including *Salmonella enteritidis*. An effective rodent and pest program should be provided in poultry houses, egg processing rooms, egg cooling rooms, and any feed manufacturing plants on the farm.

- A professional service company should provide a detailed plan for eliminating/controlling the rodent/pest problem. The company must provide the egg producer with a hard-copy report of work performed.
- For those producers using a “Do It Yourself” program, a detailed reporting system must be maintained to verify that this critical control point is being monitored.

CCP#2 Control Rodents

A single mouse produces 100 droppings a day and each can contain up to 230,000 SE bacteria. Rodents can spread infection throughout the chicken house and contaminate eggs. They can carry SE to nearby poultry houses.

A Seal Rodents Out

(1) Keep the exterior of poultry houses free of high vegetation, debris, and feed. Keep all debris 10' from the house, and mow the area regularly. Establish a 3' section of crushed rock at 6" depth around the building perimeter. Clean spilled feed and dispose of cull eggs and birds.

CCP#2 Control Rodents

(2) Seal rodents out of poultry houses and destroy harborage areas within houses.

- Make sure metal siding on the lower portion of the poultry house is securely attached to the foundation to prevent rodent entry. Rodents can climb directly up porous concrete foundations, pipes, and wires.
- Building exteriors should be tightly sealed, with no gaps greater than 1/4 inch.
- Drainage for the building may be constructed with large polyvinyl chloride pipes fitted with removable screw lids or grates with openings no larger than 1/4 inch.

CCP#2 Control Rodents

- To ensure entrance doors and pit unloading doors close tightly, use either mechanical door fasteners, improved door tracking, maintenance of concrete pit slabs, thick rubber weather stripping with a metal base attached to the bottom of doors, or 2x8 inch wood board mounted inside pit load-out doors.
- Holes that previously may have housed rodents infected with SE can serve as source of infection for future rodent populations, so any previously established areas inside the facility should be sealed.
- Eliminate other potential harborage sites within the house. Knock manure off cage support beams every 6-8 weeks. Remove manure from the pit whenever possible as rodents may live in manure piles.

CCP#2 Control Rodents

B Maintain Covered Bait Stations.

- Rodenticides (poison baits and tracking powders) include pellets, meals, liquids, and paraffin blocks and bars.
- Covered bait stations are used in the most successful programs. They keep bait clean and provide a secure place for rodents to feed undisturbed.
- Place stations along all cage row walkways at 10-20' intervals. Locate stations in the walkways between houses, in utility and egg-packing rooms, and in pit entrance areas.
- Rodents may be active year-round in the attic or may travel there during cleaning and disinfection of a facility. A trial baiting of the attic is recommended. Place small amounts of bait at several locations above the feed equipment area for the first 20' of the house. Recheck the bait in 2-4 days.

CCP#2 Control Rodents

B Maintain Covered Bait Stations (cont'd).

- Where rats are the major pest, bait stations can be placed at less frequent intervals and at specific harborage or feeding sites.
- Wearing disposable gloves or using a long-handled spoon and following label directions, place 1-2 teaspoons of fresh bait in stations every 3-4 weeks.
- Tracking powders get on rodents' feet and fur when they travel through it. During grooming, they ingest the powder. These can be applied as a dust to holes, nesting areas, and rodenticide stations The toxicant is 10-40 times stronger than baits and should not be used in food production areas.

PEQAP

CCP#2 Control Rodents

B Maintain Covered Bait Stations (cont'd).

- Zinc phosphide baits should not be used more than twice yearly, because of taste which will be rejected over time. All baits should be kept fresh.
- Store rodenticides in tightly sealed containers in a secure area away from petroleum products and other materials with odors that can be absorbed by the rodenticide
- Keep an inventory of several baits containing different food base ingredients (e.g., pellets, meal). Change bait at least every 3-4 weeks to keep it fresh or as it is consumed. It may be useful to determine "bait preference" before baiting all stations.
- Follow a complete and comprehensive rodent control program throughout the life of the flock rather than relying on control measures primarily at the time of farm clean-out so that rodents will not contaminate the environment.

CCP#2 Control Rodents

C Monitor Rodents with Rodent Indexing.

Monitoring the number of rodents in a poultry house is an important part of a complete rodent control program. The usual of visual evaluation and live traps assess the relative numbers and the quality of the control program.

- Place 12 traps in areas where mice are most likely to be caught (cage walkways, pit ledges, fan housings, pit). Leave them in the house for a week but check them twice and move those traps which haven't caught a mouse by the first check.
- Inspect visually when its dark, using a flashlight
- Keep records of number trapped or sighted, and bait consumption.

CCP#3 Place Clean Pullet Chicks

Always purchase clean pullet chicks from U.S. Sanitation Monitored SE negative breeder flocks. Request documentation of breeder SE status from the hatcher supplying pullet chicks and decline the chicks if documentation cannot be provided.

1 Sample every tenth chick box drooping papers and culture for SE.

- If culture results are positive, verify the dropping paper results, notify the hatchery, and culture the pullet house environment.
- If the environment (manure) cultures are positive, do one of:
  - Destroy the flock in a humane fashion,
  - Rear chicks under a rigorous SE reduction program that includes: weekly manure removal, aggressive rodent control, vaccination with an approved SE bacterin, and treatment with antibiotics in rotation with a probiotic.

CCP#3 Place Clean Pullet Chicks

2. Clean and disinfect the pullet house before introducing the next flock.
3. Pullet organ cultures and further environmental cultures are necessary to substantiate the SE status of the flock after the corrective actions have been completed. File records of samples and actions taken.
4. Additional pullet management steps can include vaccination with an approved SE bacterin, periodic sanitizing of the water system, and supplying clean fresh feed from a mill practicing American Feed Industry Assn sanitation principles and using only appropriate animal protein sources.

Monitor the Environment

Bacterial evaluation of the environment (manure) is a check on the effectiveness of the actions taken at the three critical control point areas.

- Pullets

  1. Designate someone to oversee the proper sampling of the house, submitting samples to the laboratory, and keep records of the samples.

  2. Collect manure samples when pullets are 10-15 weeks old and culture for SE.

  3. If results are positive, notify the pullet buyer and reculture the pullet house. Proceed with one of the CCP#3 corrective actions.

Monitor the Environment

- Hens

1. Designate someone to oversee the proper sampling of the house, submitting samples to the laboratory, and keep records of the samples.
2. Implement the sampling program.
3. If SE-positive pullets were placed in the laying house, take environmental samples at 7-14 days following placement
4. Take environmental samples of all laying flocks at 29-31 weeks and again at 44-46 weeks of age. If a flock is force molted, take additional environmental samples at 5-7 weeks following the return to full feed.
5. Record dates, times, and details of samples and submissions.

PEQAP

Monitor the Environment

- Hens

  If any manure samples test positive for SE, take the following steps:

  1. Review the biosecurity program and all CCPs for potential weaknesses and correct.
  2. Initiate egg monitoring and discontinue environmental testing once egg testing is in progress.
  3. Clean and disinfect the laying house before introducing the next flock.
  4. Keep records on these actions.

Monitor Eggs

Egg monitoring is required for hen flocks in environments that test positive for SE. Initiation of egg testing eliminates the need for any further environmental testing. The results of egg testing determine whether eggs must be diverted for pasteurization or hard cooking rather than offered to the consumer as table eggs.

1. Designate someone to be responsible for proper collection of eggs, submission to the laboratory, and record keeping.
2. Implement the egg sampling program.

Monitor Eggs

3. Collect and submit eggs four times at two-week intervals. Each submission consists of 510 nest run eggs.
4. If the four initial egg submissions are negative, continue to submit 510 eggs once a month for the life of the flock.
5. Keep records on dates, times, and details of all egg collections and submissions.

Monitor Eggs

If any eggs test positive, take the following corrective steps:

1. Immediately divert all flock eggs from the table egg market to pasteurization or hard cooking.
2. Review “Biosecurity risk factors” and CCPs for potentail weaknesses and correct them.
3. Keep records on these actions.

Monitor Eggs

To attempt to return the flock's eggs to the table egg market, take the following additional monitoring steps:

1. Collect and submit 1,080 eggs four times at two-week intervals or make a one time 4,320 egg submission.
2. If all test results are negative, the flock's eggs may be returned to the table egg market; however, monthly submissions of 510 eggs are required for the remaining life of the flock.
3. If one or more test results are positive, continue diversion, and retest if desired. No further testing is permitted after 3 SE positive egg collection cultures over the life of the flock.
4. Keep records on the dates, times, and details of all collections and submissions.

PEQAP

Validation

Monitoring the program is extremely important. Monitoring forms assist producers, processors, and marketers maintain documentation that each critical point is being monitored.

Proper Egg Washing

- Bacteria on the egg shell is destroyed when the wash water temperature is no less than 100° and the pH is 11 or greater.
- Eggs should be washed as soon as possible after they are laid. It is important to use a detergent that contains ingredients which quickly penetrate, soften, and remove the soils from the egg shell.
- All wash water, detergents, and sanitizers should be changed frequently (every 2-4 hours of running time for in-line washers).

United Egg Producers

Proper Egg Washing

UEP recommends monitoring of this critical control point by recording the date, time, temperature, and concentration levels.

- pH of wash water: pH paper; pH meter (hand held); pH meter (table model); digital read out; logger computer program; recorder.
- Wash water & rinse temperature: dial type thermometer (tank mount & hand held); digital read-out; logger computer program; controller.
- Sanitizer concentration: chlorine or quat titration test kits; recorder.

United Egg Producers

Refrigeration

Eggs must be refrigerated as quickly as possible after washing and grading.

- Cooler room temperatures must be maintained at an average ambient temperature of 45° F or below.
- Transport vehicles must have refrigeration units capable of producing air at 45° F or below.
- Temperature recording devices should be in operation to provide a recording that the desired temperatures were maintained. If the on-farm cooler or transport vehicle shows temperatures above the desired level, a maintenance person should be notified and corrective measures taken.

United Egg Producers

Egg Quality Assurance

Eggs are to be refrigerated according to applicable federal, state, or local laws. Plastic egg flats should be washed and sanitized after each use or returned to the originating farm to avoid cross-contamination.

Egg Quality Assurance

- Third-party verification may play a role in providing the necessary assurances that the egg industry is following guidelines which results in the safest possible products.
- FDA, CFSAN, recommends that a minimal testing program include environmental sampling (manure pits and egg belts) to verify that the measures producers use are adequate to ensure the safety of eggs. This sampling can be conducted two to three weeks prior to depopulation.
- Results used to determine if strict cleaning and disinfection measures are needed to decontaminate the environment prior to placement of new pullets into the facility.
- Records of management practices facilitates investigation and provides concrete evidence of producers' preventive program efforts.

Egg Quality Assurance

- Rely on voluntary industry developed and supported quality assurance programs based on proven prevention strategies,
- Explore a modified HACCP approach to establish good production practices to further reduce potential pathogens found on the farm.
- More studies and economic analyses are needed to:
  - Identify which intervention strategies are appropriate,
  - Cost-effective management practices that should be included in SE risk-reduction programs.
- Monitoring strategies that evaluate the effectiveness of quality assurance programs are important.

References

Davison, S.A., P.A. Dunn, D.J. Henzler, S.J. Knabel, P.H. Patterson, and J.H. Schwartz. Preharvest HACCP in the Table Egg Industry. http://pubs.cas.psu.edu/FreePubs/pdfs/AGRS72.pdf

United Egg Producers. UEP "5-Star" Total Quality Assurance Program. UEP, Atlanta, GA.