Small Flock Poultry Program

Monday, May 18: Getting Your Flock Started
Tuesday, May 19: Healthy Management Practices
Wednesday, May 20: How to Increase Egg Production
Thursday, May 21: Egg Handling, Food Safety and Egg Sales
Egg Handling and Sales

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Department of Poultry Science
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Today’s Presentation

- Egg safety
- Nest management
- Egg handling
- Egg cleaning and disinfection
- Egg storage
- Egg quality
- Egg sales
Almost 100 sick in Salmonella outbreak linked to backyard poultry flocks

By News Desk on May 21, 2020

The Centers for Disease Control and Prevention is currently investigating an outbreak of Salmonella Hadar reported in 28 states. There has been a total of 97 people infected with the outbreak strain.

Seventeen people — representing more than a third of those with information available — have been hospitalized. No deaths have been reported, according to the CDC’s outbreak notice.

Thirty percent of the people infected with the strain are children younger than 5 years of age.
Epidemiologic evidence shows that contact with backyard poultry, such as chicks and ducklings, is the likely source of this outbreak. In interviews with patients, 86 percent reported contact with chicks and ducklings. The infected people reported obtaining chicks and ducklings from several sources, including agricultural stores, websites and hatcheries.

**Numbers at a glance:**

- Reported Cases: 97
- States: 28
- Hospitalizations: 17
- Deaths: 0

Backyard poultry can carry Salmonella germs that can make people sick, even when the birds look healthy and clean. Backyard flock owners should always follow steps to stay healthy around their poultry.
2019 Outbreak

This outbreak is similar to a deadly cluster of outbreaks from this past year. The CDC concluded an investigation in October, 2019. The 13 multistate outbreaks of Salmonella infections were linked to contact with backyard poultry. These investigations found that the outbreaks in 2019 represent the largest recorded number of people in a single year to become sick with Salmonella after contact with backyard poultry.

There were 1,134 people infected with the outbreak strains of Salmonella. They were from 49 states and the District of Columbia. Of the 740 people with information available, 219, or 30 percent, were hospitalized. Two deaths were reported, one from Texas and one from Ohio. Of the 988 ill people with information available, 212, or 21 percent, were children younger than 5 years old. In interviews, 392, or 63 percent, of 619 ill people reported contact with chicks or ducklings.

2019 numbers at a glance:

- Reported Cases: 1134
- States: 49
- Hospitalizations: 219
- Deaths: 2
Salmonella

- It’s a bacteria
- Natural inhabitant of the intestinal tract of many animals, including birds
- Birds are likely non-symptomatic carriers
- There are over 2,000 different serotypes
- Vaccination not possible for all types
- Can cause severe gastrointestinal illness in humans
- Proper hygiene important to prevent infection
- Killed by proper cooking (>160°F)
Preventing Salmonella Infection

- CDC Guidelines for backyard flock owners
  - Wash your hands
    - Supervise hand washing of children
    - Use alcohol-based hand sanitizer
  - Do not let birds inside the house
  - Do not clean poultry equipment in the kitchen
  - Do not let children younger than 5 years of age handle birds without supervision
  - Do not kiss or snuggle birds close to your face
  - Do not track manure into the house on your shoes
Eggs and Food Safety

- Microbiological safety of eggs and egg products depends on several factors
  - Initial population of pathogenic microorganisms
    - From birds, nest, dust, dirt, your hands, etc.
  - Adhering organic material
  - Egg cleaning method
    - Wash water conditions (temperature and pH)
  - Cooling rate
  - Maintaining refrigeration temperatures (<45°F)
Start With Clean Eggs

Change litter in box-type nests regularly
Clean, ample litter

Insufficient litter, causing egg breakage and dirty eggs
Nest Management

- Excluding birds from roosting in nest boxes at night will keep nests cleaner
- 4 to 5 birds per nest
Nest Management

- **Rollout nests** are superior for egg cleanliness and ease of collection.
- Can help to discourage “egg eaters”.
- Best to start with pullets prior to the onset of egg production.
- Hens accustomed to litter material may not utilize nests if pads added.
Rollout Nests
Rollout Nests
Nest Pads

- Less organic matter to harbor bacteria
- Can be cleaned and sanitized
- Hens won’t scratch it out

Allows better air circulation and deters manure buildup.

- 12” x 13” nest pads, with unique ventilation slot design, allow for maximum air and debris flow, reducing the percentage of contaminated eggs.
- Clean-up time is quick and easy.
- Molded from a special UV-resistant plastic, these pads have a useable life expectancy of up to 7 years.
- Offers comfort to your hens, while resisting lice, insects, rot, mildew and fungus growth.
- Encourages hens to use the proper nesting site.
- We recommend one nest pad for each nest hole.

GRAY NEST PAD

<table>
<thead>
<tr>
<th>STK#</th>
<th>EACH</th>
<th>100 &amp; UP</th>
</tr>
</thead>
<tbody>
<tr>
<td>EH1406</td>
<td>$3.99</td>
<td>$3.29</td>
</tr>
</tbody>
</table>
Chick-Inn Laying Nests promote poultry health, greater egg production.

- 4 and 6-Hole Laying Nests, with plastic lids and front and back partitions, are ideal for smaller or specially configured pens.
- Popular 8 and 10-Hole Laying Nests are made of galvanized steel and are easy to assemble with a pop rivet gun.
- High front and back panels prevent litter from being scratched out of nests.
- Removable plastic bottom inserts on 4, 6 and 8-hole nests are easy to clean, keeping birds healthier.
- Perches are hinged upward.
- Nest pads, sold separately below, offer comfort, reduce chances of bacterial contamination and encourage hens to use proper nesting sites. We recommend one nest pad for each nest hole.

CHICK-INN LAYING NESTS

<table>
<thead>
<tr>
<th>STK#</th>
<th>STYLE</th>
<th>SIZE</th>
<th>EACH</th>
<th>DISCOUNT PRICE</th>
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<tr>
<td>103674</td>
<td>4 Hole</td>
<td>33''H x 24''W</td>
<td>$156.35</td>
<td>$151.65 (4 &amp; up)</td>
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<tr>
<td>103675</td>
<td>6 Hole</td>
<td>33''H x 36''W</td>
<td>$173.35</td>
<td>168.15 (4 &amp; up)</td>
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<tr>
<td>103676</td>
<td>8 Hole</td>
<td>33''H x 48''W</td>
<td>$203.75</td>
<td>197.65 (4 &amp; up)</td>
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<tr>
<td>105356</td>
<td>10 Hole</td>
<td>34-1/2''H x 60''W</td>
<td>$214.95</td>
<td>208.49 (4 &amp; up)</td>
</tr>
<tr>
<td>EH1406*</td>
<td>Nest Pad</td>
<td>12''x13''</td>
<td>3.99</td>
<td>3.29 (100 &amp; up)</td>
</tr>
</tbody>
</table>

* Nest Pad shown below.
Rollout nest offers easier egg collection, less breakage.

- Individual rollout bottoms on each of ten nests is a huge convenience.
- Front-access rollout drawers are noncorroding plastic.
- Eggs are cleaner, with less breakage.
- Rustproof, heavy galvanized steel frame measures 33"H x 60"W with 7"H x 11.5"W holes.
- Easy to assemble with a pop rivet gun.
- Optional rollout, die-cut Nest Pad sold separately.

Collect eggs without disturbing hens.

10-HOLE FRONT ROLLOUT NEST AND NEST PAD

<table>
<thead>
<tr>
<th>STK#</th>
<th>ITEM</th>
<th>EACH</th>
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<tr>
<td>103919</td>
<td>Nest</td>
<td>$329.95</td>
<td>$309.95</td>
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<tr>
<td>109162</td>
<td>Nest Pad</td>
<td>5.69</td>
<td>5.49</td>
</tr>
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</table>
Preventing Floor Egg Laying

- Avoid direct light into boxes (make boxes as dark as possible)
- Collect floor eggs frequently to discourage laying on floors
- Disrupt floor or ground nest sites to discourage laying
Shell Structure

- Eggshell pores
  - Domestic chicken pores are unbranched
  - Other species have variety of different pore structures
    - Average egg contains 7,000 – 17,000 pores
    - Most distributed at large end of egg
Shell Structure

- **Cuticle (bloom)**
  - Waxy, organic covering spread over eggshell as it is expelled from the hen.
  - Functions to:
    - regulate the exchange of gases across the shell
    - prevent microbial invasion
The Eggshell Cuticle

- Regarded by many people as the best barrier against microbial invasion of the egg
- However, it has been found that cuticle coverage, thickness and quality decreases with hen age

Assessing Cuticle Coverage

- Journal of Food Protection (Vol. 74, No. 10, pg 1649-1654, 2011)
- Concluded “eggs from older hens inherently have poorer cuticle coverage”

<table>
<thead>
<tr>
<th>Cuticle coverage</th>
<th>Brown eggs (%)</th>
<th>White eggs (%)</th>
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<tbody>
<tr>
<td>Even</td>
<td>23.3</td>
<td>3.3</td>
</tr>
<tr>
<td>Occasionally patchy</td>
<td>43.3</td>
<td>30.0</td>
</tr>
<tr>
<td>Very patchy</td>
<td>13.3</td>
<td>53.3</td>
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<tr>
<td>No cuticle</td>
<td>20.0</td>
<td>13.3</td>
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<table>
<thead>
<tr>
<th>Exposed pores</th>
<th>Brown eggs (%)</th>
<th>White eggs (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>None visible</td>
<td>26.7</td>
<td>23.3</td>
</tr>
<tr>
<td>Occasional pore visible</td>
<td>40.0</td>
<td>46.7</td>
</tr>
<tr>
<td>Frequently observed</td>
<td>33.3</td>
<td>30.0</td>
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Assessing Cuticle Coverage

- Dye experiment
- Eggs from young, middle-aged and old Leghorn hens
- Dipped in red food coloring solution for 1 minute
Assessing Cuticle Coverage

Young  Middle  Old
Spots indicate where dye infiltrated through the pores of the egg
Washing of Eggs

- Most washing procedures will remove the cuticle (bloom).

- The following are “generally accepted recommendations” for egg washing:
  - Dipping or soaking (submersion) of eggs is highly discouraged.
    - may aid in bacterial penetration of shell through pores
    - increase cross contamination between eggs
Washing of Eggs

- Washing should be done by spraying eggs with a wash solution
  - use an approved egg detergent
  - wash water conditions very important
- Wash water should be at least 20°F warmer than the internal temperature of the eggs
  - minimum of 90°F
Example egg detergent

Source:
Syn-Co Chemical Company
Spring Branch, Texas
830-885-4143
Washing of Eggs

- Following washing, eggs should be rinsed with clean water by spraying
  - rinse water should be slightly warmer than wash water
  - Can apply an approved sanitizer
    - chlorine or a quaternary ammonium compound at 100-200 ppm is most commonly used
- Dry eggs before packaging
DISAN-1
Disinfectant-Sanitizer-Food Contact Sanitizer
Fungicide, Virucide®, For Poultry/Turkey, Federally Inspected Meat and Poultry Plants
This product is recommended for use as an Egg Shell sanitizer, with best results achieved in water temperature ranging from 78°-100°F

ACTIVE INGREDIENT:
Alkyl (50% C₁₄, 40% C₁₂, 10% C₁₈) dimethyl benzyl ammonium chloride................................. 10.0%
INERT INGREDIENTS:
TOTAL: .................................................................................. 100.0%

KEEP OUT OF REACH OF CHILDREN
DANGER
See right panel for additional precautionary statements

Source:
Syn-Co Chemical Company
Spring Branch, Texas
830-885-4143
Disinfecting Wipes
Kills 99.9% of Viruses* & Bacteria
Fresh Scent
Safe on Finished Wood, Sealed Granite and Stainless Steel

85 Wet Wipes
1 LB 5.1 OZ (598 g)

**Does not include weight of dry wipe.
Storage of Eggs

- Eggs should be refrigerated as quickly as possible after cleaning and grading to preserve quality and reduce the potential for bacterial growth.

- USDA, FDA, TDA and DSHS regulations:
  - Must be maintained at 45 °F or less at all times
TAMU Home Egg Washing Study

- Eggs with adhering material cleaned with:
  1) Sandpaper
  2) Sponge - cleaned with sponge soaked in organic egg wash, then rinsed with warm tap water
  3) Soak - soaked in organic egg wash for 15 minutes, then rinsed with warm tap water
  4) Peroxide - sprayed with hydrogen peroxide, then rinsed with warm tap water

Storage
- ½ of sandpaper eggs refrigerated and ½ not refrigerated
- All other treatments refrigerated
Sandpaper cleaning
Sponge cleaning

Washing fluid temperature at least 95°F

Eggs placed in new cartons for storage in cooler
Soaked in egg wash and rinsed

Washing fluid temperature at least 95°F
Peroxide spraying
Total External Eggshell Bacteria – Trial 1

- **Day 1**
- **Day 7**
- **Day 21**

<table>
<thead>
<tr>
<th>Method</th>
<th>Day 1</th>
<th>Day 7</th>
<th>Day 21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sandpaper - room</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sandpaper - refrig</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sponge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soak</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peroxide</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
External Eggshell Coliforms – Trial 1

(number of positive eggs)

Note: all counts extremely low
Egg contents bacteria – Trial 1

(number of positive eggs)

Note: all counts extremely low

- Sandpaper room
- Sandpaper refrig
- Sponge
- Soak
- Peroxide

# positive out of 10 eggs
Total External Eggshell Bacteria – Trial 2

- Sandpaper room
- Sandpaper refrig
- Sponge
- Soak
- Peroxide

Day 1, Day 14, Day 24
External Eggshell Coliforms – Trial 2

(number of positive eggs)

Note: all counts extremely low
Internal Eggshell Swabs – Trial 2

(number of positive eggs)

Note: all counts extremely low
Study Conclusions

- The method of egg washing is less important
- Wash water conditions and proper handling more important for proper cleaning and reduced contamination
- Washing does not eliminate microorganisms from the shell
- Use of post-wash sanitizers should be considered
Home Egg Disinfection Study

- Visibly clean eggs collected from caged layers

- Treatments
  1) Control (nothing)
  2) Tap water rinse (95°F)
  3) Water rinsed, air dry, then wiped with vinegar soaked paper towel
  4) Water rinsed, air dry, then sprayed with 200 ppm bleach solution
  5) Water rinsed, air dry, then sprayed with quaternary ammonium solution (Disan)
Disinfectant spray application

- Sprayed until visibly wet, rotated 180° with tongs, and sprayed on other side
Egg handling

- Eggs allowed to air dry on baking rack
- Placed in new, clean foam cartons
- Stored in refrigerator
- Bacterial counts performed on day of treatment and after 43 days of storage
- Eggs were candled and graded each week
Total External Eggshell Bacteria

![Bar chart showing the total external eggshell bacteria for different treatments over 43 days. The treatments include Control, Tap water rinse, Vinegar wipe, Cl spray, and Quat spray. The chart compares the number of bacteria on Day 1 and Day 43 for each treatment.]
# Egg quality during storage

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Day 7</th>
<th>Day 14</th>
<th>Day 21</th>
<th>Day 28</th>
<th>Day 35</th>
<th>Day 43</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>7</td>
<td>0</td>
</tr>
<tr>
<td>Tap water rinse</td>
<td>12</td>
<td>0</td>
<td>1</td>
<td>8</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>Vinegar wiped</td>
<td>12</td>
<td>0</td>
<td>1</td>
<td>4</td>
<td>8</td>
<td>0</td>
</tr>
<tr>
<td>Bleach solution</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>12</td>
<td>0</td>
</tr>
<tr>
<td>Quaternary ammonium solution</td>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>10</td>
</tr>
</tbody>
</table>
Another Study Comparing Eggshell Sanitizers

(Al-Ajeeli et al., 2016 Poultry Science 95:1191-1197)
Consumer taste panel

(Al-Ajeeli et al., 2016 *Poultry Science* 95:1191-1197)

9 point hedonic test

Overall like flavor

![Bar chart showing overall like flavor scores for control, chlorine, quaternary ammonium, and hydrogen peroxide with UV light treatments. The scores range from 6 to 8 on a 9-point scale.](image)
Consumer taste panel
(Al-Ajeeli et al., 2016 *Poultry Science* 95:1191-1197)

9 point hedonic test
Overall like texture

![Bar chart showing consumer taste panel results](image-url)
Conclusions on Egg Disinfection

- Application of most disinfectants do not completely eliminate bacteria from eggshell surface
- Eggs should be handled like any other raw animal product (wash hands and utensils after contact)
- Quaternary ammonium is the most effective method available to small flock producers
- Wiping eggs with vinegar was as good as spraying with chlorine solution
- Proper application of disinfectants does not affect egg quality or sensory attributes
Impact of egg handling and conditions during extended storage on egg quality

D R Jones, G E Ward, P Regmi, and D M Karcher

USDA-ARS, University of Georgia, and Purdue University
Treatments

- Washed and refrigerated
  - Meets State law and USDA standards
- Washed, oiled, and refrigerated
  - Meets State law and USDA standards
- Unwashed and refrigerated
  - Meets State law
- Unwashed and not refrigerated
  - Does not meet any state or federal standards
Change in Haugh unit scores (albumen quality)
6 weeks; all treatments

Graph showing the change in Haugh unit scores for different grades (AA, A, B) and treatments (Washed 4°C, Washed, oiled 4°C, Unwashed 4°C, Unwashed 22°C) over 6 weeks of storage.
Change in yolk quality
6 weeks; all treatments

[Graphs showing changes in height, width, and yolk index over storage time for different treatments.]
Refrigerated treatments through 15 weeks of storage

(Unrefrigerated eggs removed from study; rotten by 6 weeks)
Changes in Haugh unit scores

\( (P < 0.05) \)
Study Conclusions

• **Refrigeration** has greatest impact on maintaining egg quality

• < 24h at room temperature had more profound impact on yolk quality than 15 wk at refrigeration temperature

• Washed, oiled eggs at refrigeration temperature had lowest weight loss

• Washed and unwashed eggs at refrigeration has similar weight loss and egg quality
Egg Sales in Brazil

8,99
Egg Sales in Brazil

21 days of shelf life
Email pictures of unrefrigerated eggs

Bacterial spoilage called green rot
Email pictures of unrefrigerated eggs washed with cold water

Mold between shell and shell membrane
Email pictures of unrefrigerated eggs washed with cold water

Mold between shell and shell membrane
Sale of Table Eggs (Ungraded)

- Directly to consumer
  - required to obtain **food establishment license** and meet the structural requirements for a food establishment
  - licensed by **local health authority** (city, county or district) or Texas Department of State Health Services (DSHS) if no local authority exists
  - eggs must be labeled as “ungraded”
  - eggs must be labeled with producer’s name and address

- Farmers’ Markets - may have additional requirements, so check with local authorities
Eggs bought at roadside stand

What is wrong with this picture?
Against the law to sell your eggs with someone else’s name on the carton.
Retail Sale of Table Eggs

Retail food establishments (stores, restaurants, bakeries, food trucks, etc.) are not allowed to use or sell ungraded eggs.

- Eggs must be received from an approved source that is licensed by the Texas Department of Agriculture (TDA).
  - Texas Egg License
    - additional rules for packaging, labeling and inspection
- eggs must be clean, sound and at least Grade B
- must be delivered in refrigerated equipment at $45^\circ F$ or less
Sale of Table Eggs (Graded)

- TDA contact for egg licensing
  - Coordinator for Fuel Quality and Egg Quality Programs
  - 512-463-6477

- TDA Organics program
  - Coordinator for Organic Certification
  - 512-936-4178
Texas Egg License

- Things to consider:
  - all eggs must be graded (no longer allowed to sell ungraded eggs)
  - required to pay an egg inspection fee
  - must submit monthly egg reports to ensure that the correct amount of special fees are paid
Non-chicken Egg Sales
(not regulated by TDA)

- A farm may sell non-chicken eggs without a license to retail food establishments provided:
  - Labeling and packaging requirements are met
    - Cartons must be labeled “ungraded”
    - Provide the farm’s name and address
  - Temperature controls are maintained at 45° F or less
  - If the entity meets the definition of a Food Wholesaler of food products, they must possess a license as a manufacturer or wholesaler issued by DSHS

- Contact the Department of State Health Services for more information
Egg Grading

- You do not need to be “certified” to grade an egg
- Simply apply the USDA standards for grading when packing the eggs
  - All state agencies follow the USDA standards for egg grading
  - Eggs must meet the grade standard written on the package through the point of sale
Egg Grading

- Egg Grader Training for Small Flock Producers
  - Program periodically held by the Poultry Science Unit of Texas A&M AgriLife Extension Service
  - Hands-on training sessions for how to grade eggs
  - Contact Dr. Craig Coufal
  - 979-845-4319
## Egg sizes and weights

**USDA standard**

(minimum values)

<table>
<thead>
<tr>
<th>size</th>
<th>ounces/dozen</th>
<th>ounces/egg</th>
<th>g/egg</th>
<th>lb/case</th>
</tr>
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<tbody>
<tr>
<td>small</td>
<td>18</td>
<td>1.5</td>
<td>42.5</td>
<td>34</td>
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<tr>
<td>medium</td>
<td>21</td>
<td>1.75</td>
<td>49.6</td>
<td>39.5</td>
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<td>large</td>
<td>24</td>
<td>2.0</td>
<td>56.8</td>
<td>45.0</td>
</tr>
<tr>
<td>extra-large</td>
<td>27</td>
<td>2.25</td>
<td>63.8</td>
<td>50.5</td>
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<tr>
<td>jumbo</td>
<td>30</td>
<td>2.5</td>
<td>70.9</td>
<td>56</td>
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