Managing Risks of Small Scale Poultry Processing

Food Safety for Small Poultry Producers

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Organisms of Concern

Bacteria
- *Salmonella* spp.
- *Campylobacter* spp.
- *E. coli*
- *Listeria monocytogenes*
- *Clostridium* spp.

Viruses
- Hepatitis A
- Norovirus

Parasites
- *Trichinella spiralis*
Food Safety

**Salmonella**
- Economic impact: $14.6 billion / year
- Poultry and poultry products

**Campylobacter**
- Economic impact: $18.8 billion / year
- Poultry and poultry products
Pathogens

*Campylobacter*
Colonizes poultry as commensal.

Highly susceptible to stress

2nd cause of foodborne bacterial illness

Low infectious dose
Pathogens

*Campylobacter*
Causes a mild gastroenteritis

**Long** incubation period 3-5 days

Duration: 2-3 days

Mild self-limiting disease
- Diarrhea
- Vomiting
- Cramping
- Bloody stool

Antibiotic treatments are available
Pathogens

*Salmonella*

Colonizes poultry, cattle and swine.

Mainly found in poultry and poultry products

Leading cause of foodborne bacterial illness.

In 2008, FoodNet reported laboratory confirmed incidence to be **16.2** per 100,000 persons each year
Salmonella

Gastroenteritis

High infectious dose

**Short** incubation period: 1h - 2 days

Duration 2-3 days

Self-limiting disease

- Diarrhea
- Vomiting
- Cramping

Antibiotic therapy is available
Pathogens

• Young birds are susceptible to *Salmonella*
  – Outcompeted
  – Strategies to support beneficial bacteria
• *Campylobacter* colonizes at 2 to 3 weeks
  – Community dependent
  – Antimicrobials
Pre-Harvest Food Safety

Pre-harvest
Activities before products is ready to be sold.

Processing
Transformation of raw products into food.

Post-harvest
Preparation of the product for storage or processed: cleaning, cooling, packaging.
Campylobacter and Salmonella control efforts

Pre-Harvest
- Antimicrobials, vaccines, probiotics, etc.

Processing
- Antimicrobials, temperature, etc.

Post-Harvest
- Packaging
- Temperature

Consumer Education
# Rearing systems

<table>
<thead>
<tr>
<th>Conventional</th>
<th>Organic / Pasture</th>
</tr>
</thead>
<tbody>
<tr>
<td>120,000 birds on one farm</td>
<td>Less than 500 birds on one farm</td>
</tr>
<tr>
<td>Rearing period of 5 to 6 weeks</td>
<td>Rearing period of 8 weeks</td>
</tr>
<tr>
<td>Final mass about 5 to 6 lbs.</td>
<td>Final mass about 4 to 5 lbs.</td>
</tr>
<tr>
<td>Genetically well defined lines</td>
<td>Slow growers if available</td>
</tr>
<tr>
<td>Antibiotics for growth promotion or therapeutic purposes</td>
<td>Little or no antibiotics or coccidiostats</td>
</tr>
<tr>
<td>Reared indoors</td>
<td>Reared outdoors or access to outdoors</td>
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Organic Farming

• Farming without the use of prohibited substances including chemical fertilizers and synthetic pesticides, as well as genetically modified organisms (GMOs), ionizing radiation, sewage sludge and treated seeds
• List of all approved substances can be found on USDA NOP

• [http://www.tn.gov/agriculture/marketing/organiccert.shtml](http://www.tn.gov/agriculture/marketing/organiccert.shtml)

• Certification is via a 3rd party agent

• Requirements
  – No prohibited substances for the past 3 years
  – A farming plan and inspection is required to be certified
  – Extensive documentation while in operation
Organic Food Safety

Is organic food safer than conventional?


Pre-Harvest Food Safety

• Biosecurity- Preventing birds from coming in contact with pathogens

• Colonization prevention – Preventing birds from becoming colonized
Biosecurity Challenges

Minimizing contact between livestock and pathogens / vectors

Rearing conditions

Indoor (Housing)

Outdoor (Pasture)

Rotation versus all-in-all-out

Integrated farming (multi-commodity)
Sources of pathogens

- Personnel
- Vectors
  - Rodents
  - Insects
  - Birds
- Feed
- Water
- Compost
Pre-harvest Interventions

Clean feed

Pest management
- Rodent bait stations
- Insect traps
- Wild bird (animal control)

Water treatments

Personnel
- Training
- Education

Proper composting to eliminate pathogens
Colonization Prevention Strategies

*Strategies for on farm control*

- Antibiotics
- Vaccines
- Probiotics
  - *Lactobacillus, Bifidobacterium, Bacillus*
- Prebiotics
  - Fructo-oligosaccharides, alfafa,
- DFM (direct fed antimicrobials)
  - Organic acids
- Botanicals (Phytogenics)
  - Plant extracts, grape seed extracts
Strategies

Mechanisms of action

- Probiotics
  - Competitive exclusion
- Prebiotics
  - Fermentable; Support fermenting bacteria
- DFM (direct fed antimicrobials)
  - Lowers pH
- Botanicals (Phytogenics)
  - Antimicrobials
Strategies

Delivery

- Probiotics
  - Delivered in the water or feed
- Prebiotics
  - Delivered in feed
- DFM (direct fed antimicrobials)
  - Feed or water
- Botanicals (Phytogenics)
  - Feed or water
Strategies

*Advantages and Disadvantages*

- **Probiotics**
  - Improve weight gain, immune system, exclude pathogens
  - May produce inconsistent results
- **Prebiotics**
  - Stimulate growth of beneficial bacteria / synergism
  - Adjusting inclusion rate
- **DFM (direct fed antimicrobials)**
  - Exclude pathogens
  - Flavor
- **Botanicals (Phytogenics)**
  - Stimulate growth of beneficial bacteria / synergism
  - Adjusting inclusion rate / flavor
Bird Health

• A sick bird can be more susceptible to infection with *Salmonella* and *E. coli* which may increase the risk of foodborne illness

• Resources:  [http://www.vet.uga.edu/avian](http://www.vet.uga.edu/avian)
  – Diagnostic testing (web page gives sample required)

• Common Diseases
  – Mycoplasma – respiratory signs or none
  – Infectious Laryngotracheitis – ILT (Respiratory)
  – Coccidia, necrotic enteritis – gastrointestinal
Bird Health

(creamy, cheesy colored airsacs)

Respiratory illnesses = airsacculitis = E. coli
Bird Health

Coccidiosis – puss and blood

Necrotic Enteritis – thin, air filled, green
Processing

• 310 Federally inspected facilities (many are fully integrated)
• Exemption from USDA inspection - <20,000 birds (State laws may be more restrictive; not all states allow)
• Non-commerce products are also exempt
• Processors
  — lack of consistent in-flux of birds
  — Biosecurity issues
• Producers – expense and logistics
• Options
  — On-site
  — Mobile slaughter units
  — Other processing facilities
Processing Options

• On-site
  • Equipment investment
  • No transportation logistics

• Mobile slaughter units (MSU)
  • USDA has guidelines for MSUs
  • Up to 500 birds per day
  • About 10 operating
  • On-site composting option varies by state

• Other processing facilities
  • Small processors
  • Fee based
Food Safety Concerns

• Hygienic design of facility
  – Construction materials
  – Discharge of water and waste
• Proper treatment of water
  – chlorine, lactic acid, etc.
• Batch processing as opposed to continuous
Processing Interventions

**Carcass treatments**

Temperatures
  - Scalding
  - Chilling

Chemicals
  - Trisodium phosphate
  - Lactic acid

Natural extracts
  - Citrus
  - Herbs
Small processors

• Processing under the exemption (>20K)
  – USDA inspection of facility is not required
• USDA and TDA do not inspect
  – Neither agency inspects small processors
• TDA does not issue retail meat permits to these producers
  – May cause issues for farmer’s market retailers
Guidelines, Practices and Standard Procedures

• GAP (Good Agricultural Practices)
• HACCP (Hazard Analysis and Critical Control Points)
• Veterinarian inspection
• SSOPs Standard Sanitation operating procedures (compounds and schedules)
GAPs Good Agricultural Practices

Conditions and **practices** that are necessary for the manufacturing, processing, packing or storage of food to **ensure its safety** and wholesomeness.

GAP certification can be done with the USDA for fruits, vegetables and tabacco
HACCP

Analysis and control of biological, chemical, and physical hazards.

Tool to reduce, eliminate or control hazards to acceptable levels.

1) Conduct a *Hazard Analysis*
2) Determine *Critical Control Points (CCPs)*
3) Set *Critical Limits*
4) Establish CCP *Monitoring* requirements
5) Establish *Corrective Actions*
6) Establish *Verification* procedures
7) Establish *Record Keeping* procedures
Standard Sanitation Operating Procedures

• SSOPs Standard Sanitation operating procedures (compounds and schedules)
  – Clean and sanitize after processing
  – If equipment sits for more than a few days, it’s a good idea to clean and sanitize prior to processing

• Chemicals
  – Depending on organic and non-organic
  – Available at Co-OP
  – Hatcheries may also suggest and / or sell
Supplier verification

- Does the supplier participate in the National Poultry Improvement Plan?
- Does the supplier verify chicks to be free of *Salmonella*?
- Ask to visit the hatchery.
- Does the hatchery vaccinate?
- Practices?
  - drop-shipping
  - comingling
  - multiplying

Since the 1990s, 45 *Salmonella* outbreaks have been linked to live poultry.

Number of *Salmonella* Outbreaks per Year

- 1563 illnesses
- 221 hospitalizations
- 5 deaths
Maximizing return per bird

• Typically, whole birds are sold
  – Small loss of revenue (rack, consumer has to cut)

• Cuts can be sold to increase price
  – Sellers increase price to compensate their time

• If selling by weight
  – Process birds as quickly as possible so they will retain water
  – Marinades can add water weight, improve shelf-life, reduce pathogens
Thank you!