Managing Risks of Small Scale Poultry Processing

Food Safety for Small Poultry Producers

Irene Hanning, Ph.D.

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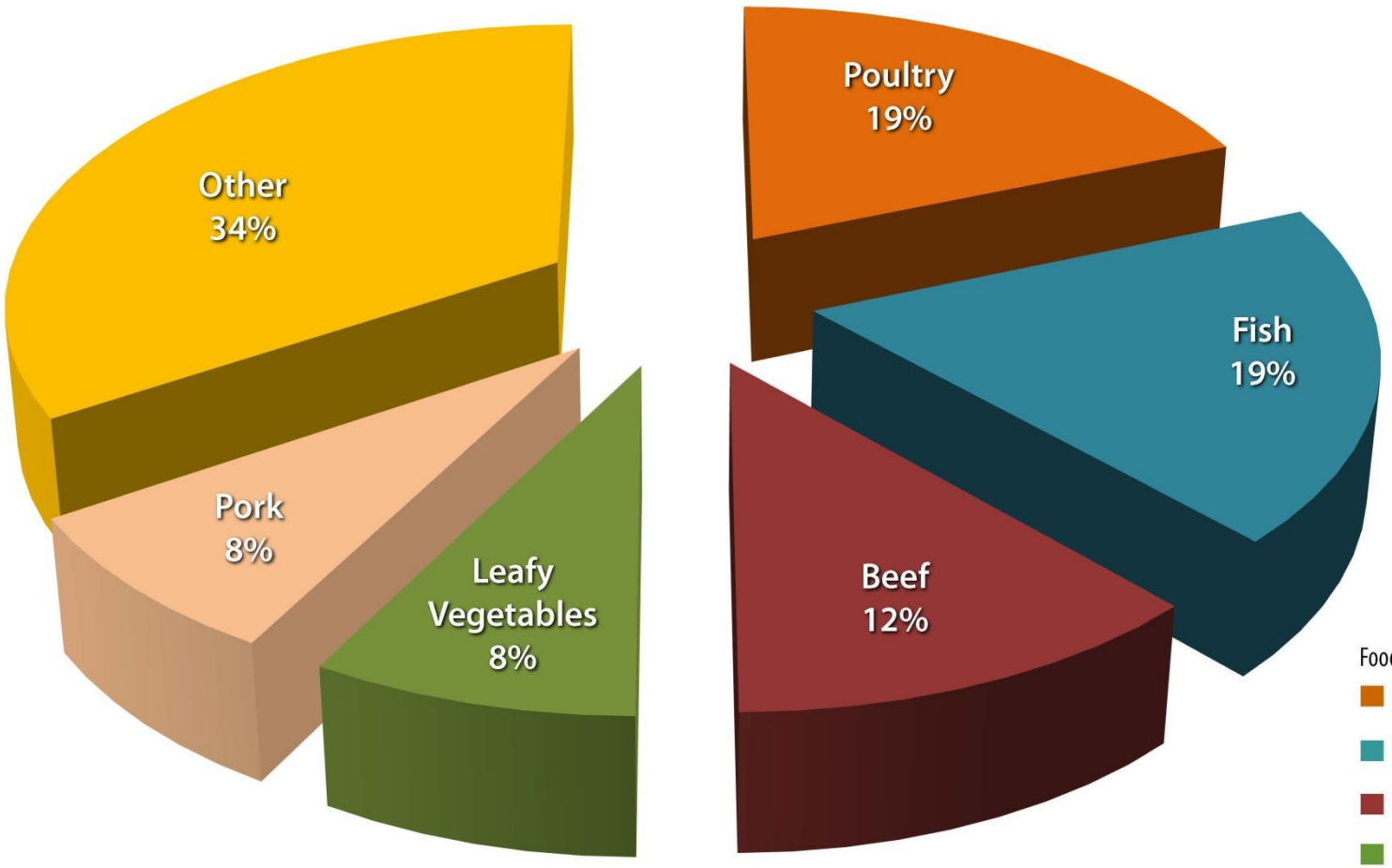
Foods Linked to Outbreaks, 1998 - 2008



Food Categories and Number of Outbreaks

- Poultry: 616
- Fish: 608
- Beef: 389
- Leafy Vegetables: 262
- Pork: 260
- Other: 1129

(Other includes, Mollusks, Fruits and Nuts, Dairy, Grains and Beans, Eggs, Crustaceans, Vine-Stalk Vegetables, Roots, Sprouts, Oils and Sugars, Game, and Fungus)

CDC. Surveillance for Foodborne Disease Outbreaks – United States, 1998-2008. MMWR 2013;62(No. SS-2).

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

Pathogens

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.

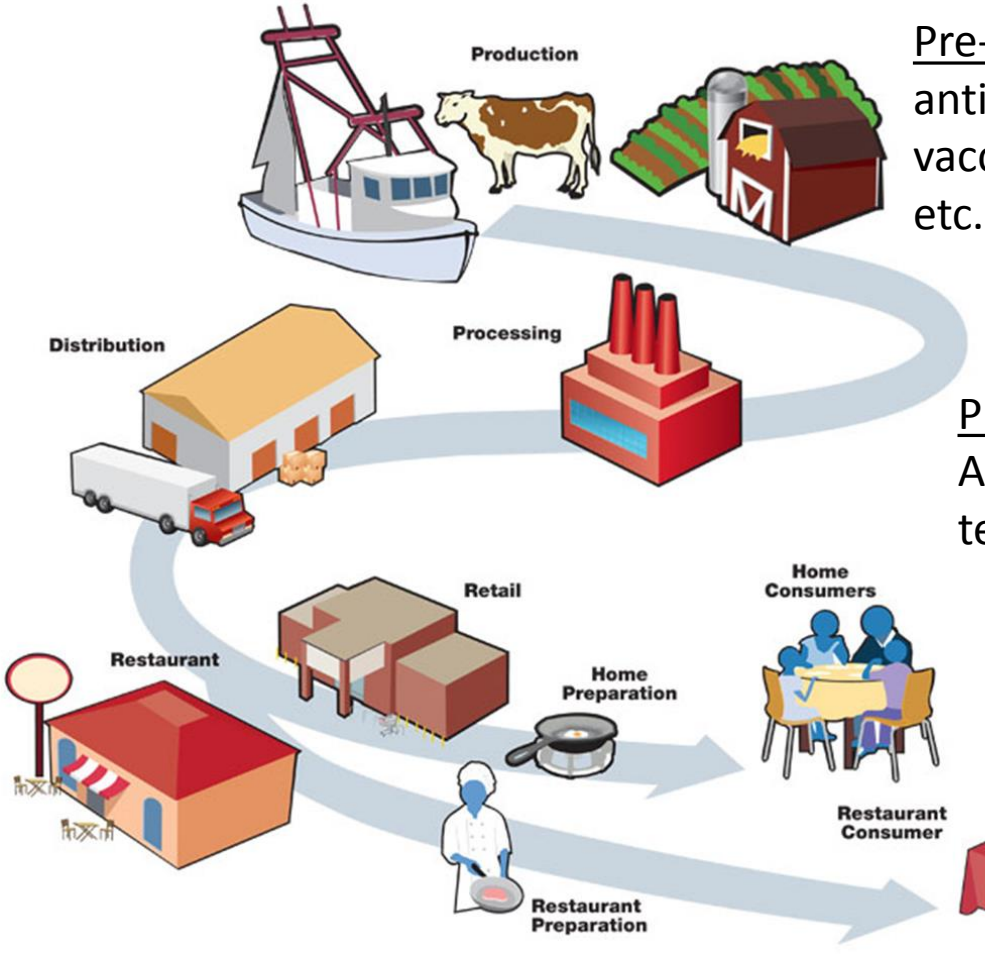
Processing

Transformation of raw products into food.

Post-harvest

Preparation of the product for storage or processed: cleaning, cooling, packaging.

Campylobacter and *Salmonella* control efforts



<u>Pre-Harvest</u>
antimicrobials, vaccines, probiotics, etc..

<u>Processing</u>
Antimicrobials, temperature, etc..

<u>Post-Harvest</u>
Packaging
Temperature

<u>Consumer</u>
Education

Rearing systems

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

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

- 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?

- Yes- *Salmonella* prevalence on the farm is lower in organic Walid Q. Alali, Siddhartha Thakur, Roy D. Berghaus, Michael P. Martin, and Wondwossen A. Gebreyes. Foodborne Pathogens and Disease. November 2010, 7(11): 1363-1371. doi:10.1089/fpd.2010.0566.
- No – *Salmonella* prevalence is higher on organic poultry carcasses Melendez, S., I. Hanning, J.Han, R. Nayak, A.R. Clement, A. Wooming, P. Herrera, , F.T. Jones, S.L. Foley and S.C. Ricke. 2010. *Salmonella* Isolated from Pasture Poultry exhibit Antimicrobial Resistance and the Presence of Class I Integrons. J Applied Microbiology. 109, 1957–1966
- They're the same – Prevalence is a function of producer not rearing type Hardy, B., N. Crilly, S. Pendleton, A. Andino, A. Wallis, N. Zhang, and I. Hanning. 2013. Impact of Rearing Conditions on the Microbiological Quality of Retail Poultry Meat. J Food Sci. 78:M1232-1235.

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

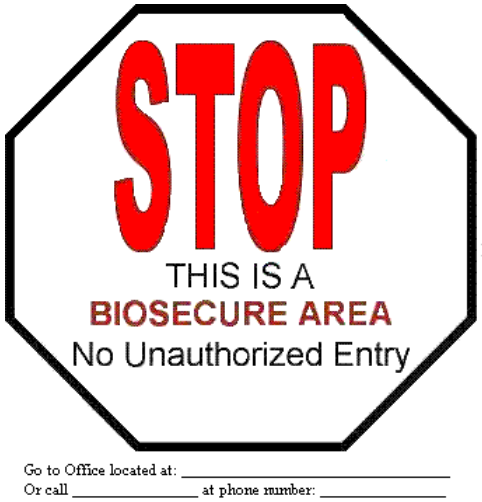
- Rodent bait stations
- Insect traps
- Wild bird (animal control)

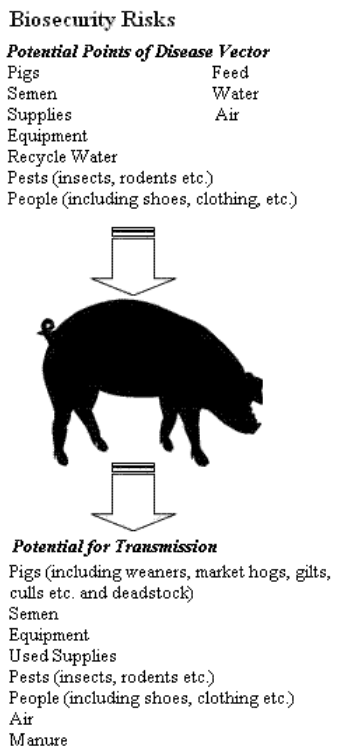
Water treatments

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, alfala,**
- **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

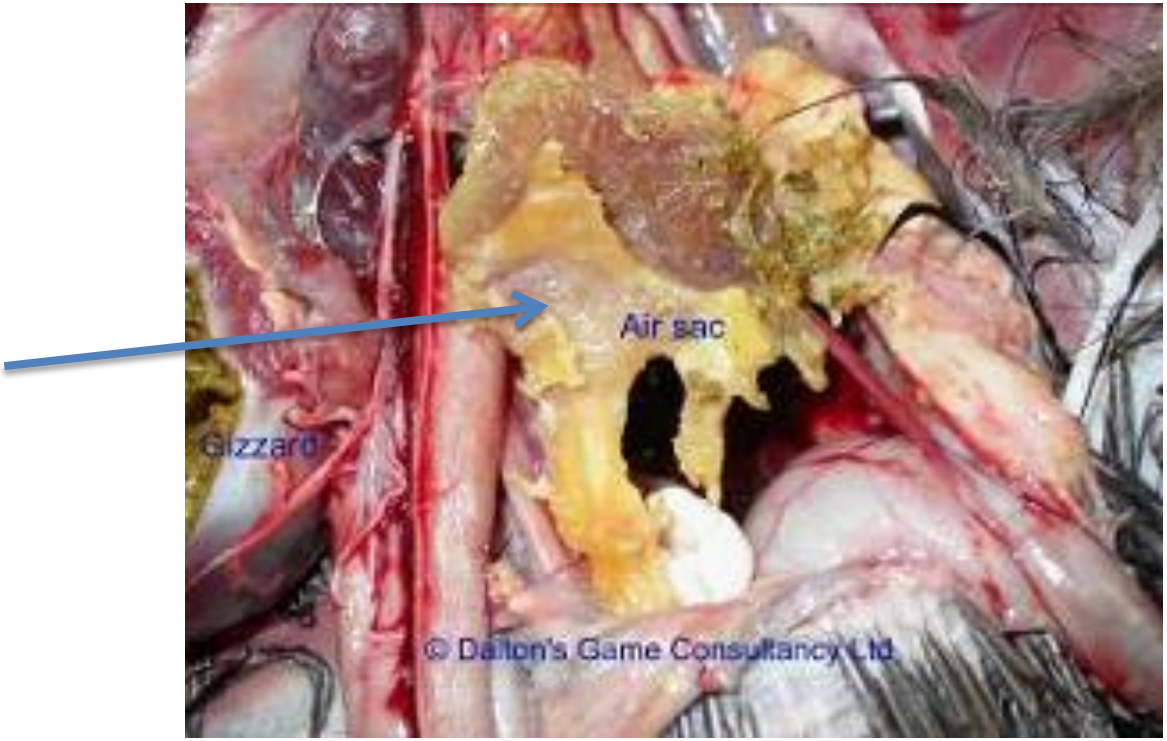
- **Probiotics**
  - **Improve weight gain, immune system, exclude pathogens**
  - **May produce inconsistent results**
- **Prebiotics**
  - **Stimulate growth of beneficial bacteria / synergism**
  - **Adjusting inclusion rate**
- **DFM (direct fed antimicrobials)**
  - **Exclude pathogens**
  - **Flavor**
- **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
  - Diagnostic testing (web page gives sample required)
- Common Diseases
  - Mycoplasma – respiratory signs or none
  - Infectious Laryngotracheitis – ILT (Respiratory)
  - Coccidia, necrotic enteritis – gastrointestinal

Bird Health

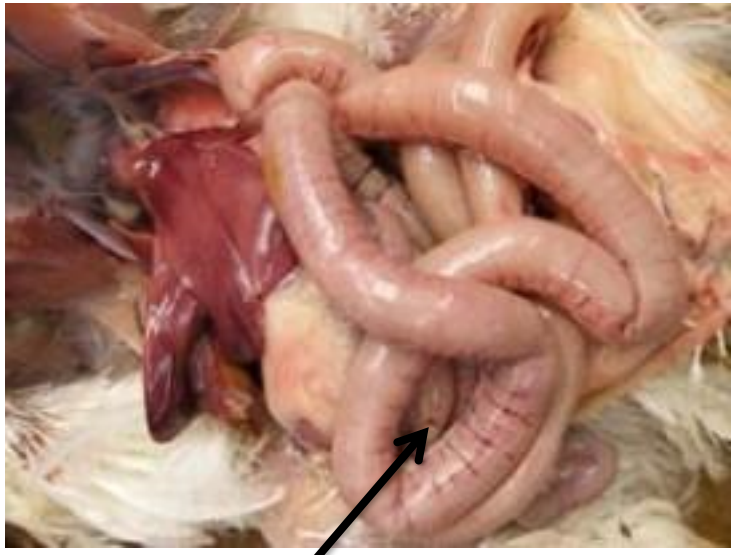
(creamy, cheesy colored airsacs)



Respiratory illnesses = airsacculitis= E. coli

Bird Health

Coccidosis – puss and blood



Necrotic Enteritis – thin, air filled, green

Processing

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.

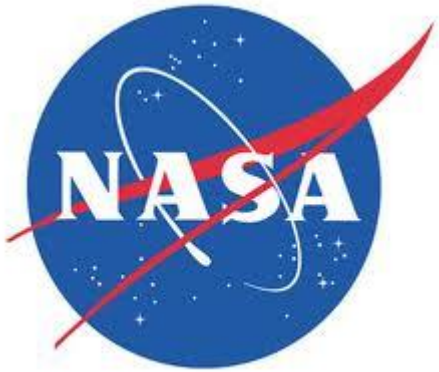
GAP certification can be done with the USDA for fruits, vegetables and tabacco

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

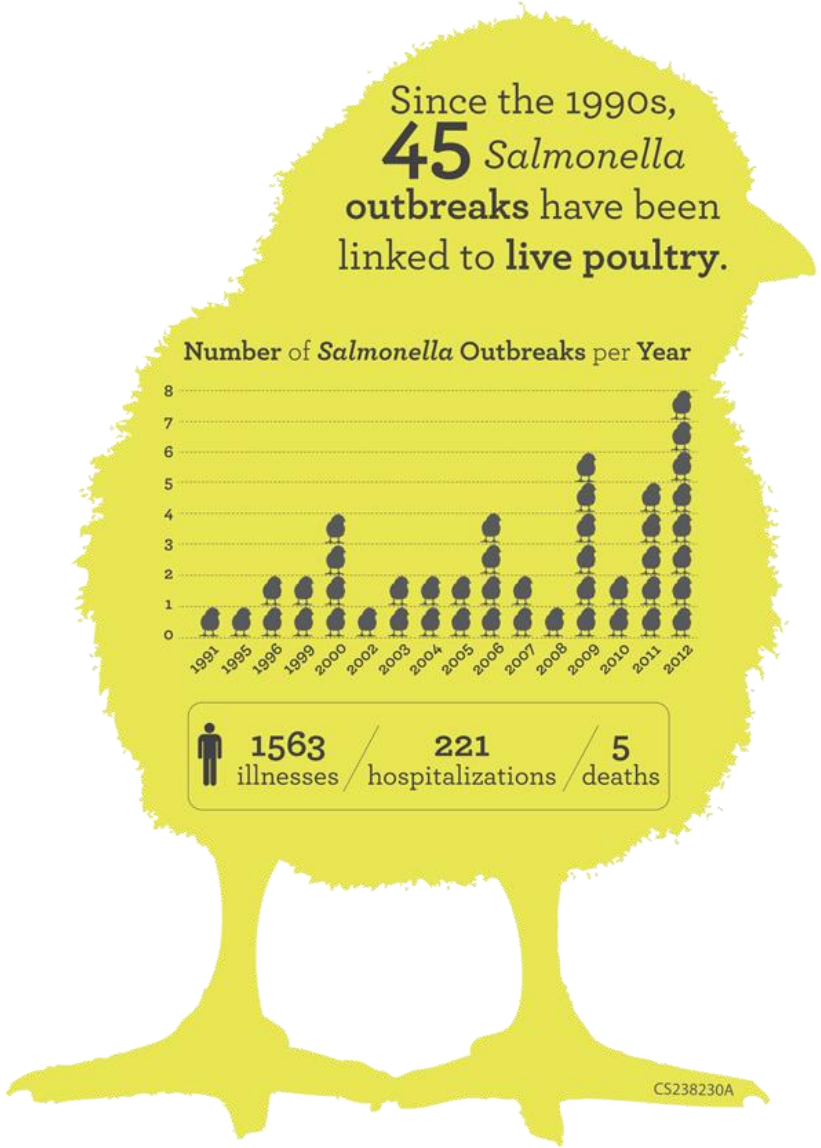


Standard Sanitation Operating Procedures

- 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



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!