



Past, Present and Future of Salmonella Control in Poultry

Dr. Dale Lauer – Assistant Director
Minnesota Board of Animal Health

2018 USAHA Committee on One Health

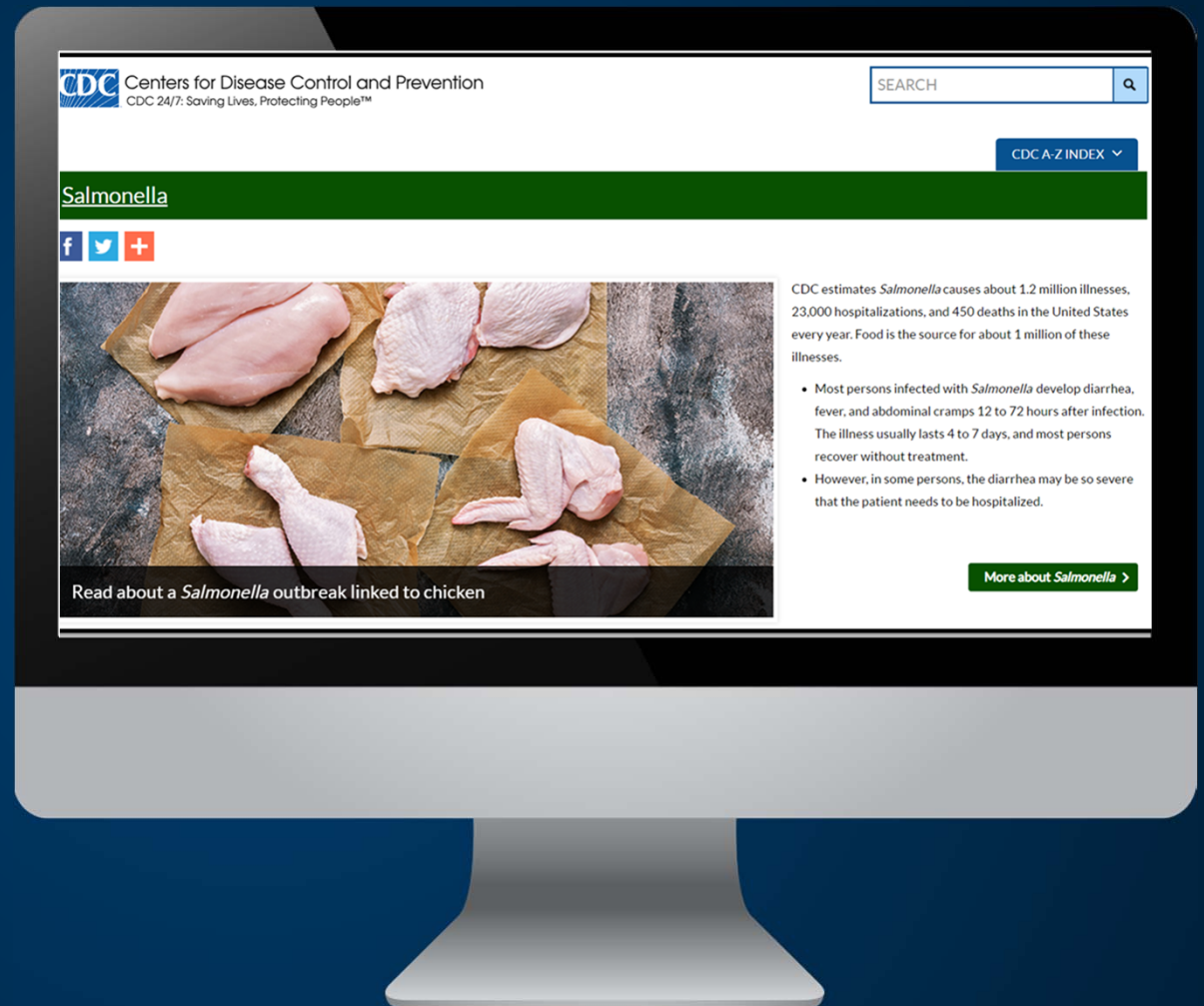
Outline Today

- Background, Current Issues
- **Past** programs of Test and Remove
- **Present** program of vaccines, testing and the role of NPIP
- **Future** challenges with live poultry production



Today's News

- Salmonella
- Outbreak
- Public Reaction



Salmonella in the News, Explosion of Information

Salmonella outbreak linked to recalled eggs expands with 38 sickened in 7 states

Mike Snider
Published 9:51 AM ET Thu, 4 Oct 2018 | Updated 2:36 PM ET Thu, 4 Oct 2018
USA TODAY



Sam Mirzovich / Reuters
A multi-state salmonella outbreak linked to eggs from an Alabama farm has expanded with 24 more people ill in five more states, the Centers for Disease Control and Prevention says.



42631



Ground Beef Chuck 30%
Lean 20% Fat Fine Grind
8-10oz Chubs

Product #12 U.S.A.

JBS Beef Link in 57 **Salmonella** Newport illnesses in 16 States

Food Poison Journal - Oct 3, 2018

Salmonella: Marler Clark, The Food Safety Law Firm, is the nation's leading law firm representing victims of Salmonella outbreaks.

6.9 million pounds of beef are recalled for possible **salmonella**. Check ...

Vox - Oct 5, 2018

[View all](#)



What to know about **Salmonella** after recent outbreaks have made ...

ABC News - Oct 4, 2018

At least 57 people in 16 states have been reported with **Salmonella** infections after consuming some of the more than 6.5 million pounds of ...

Recent **Salmonella** outbreaks have made hundreds ill

Sand Hills Express - Oct 4, 2018

[View all](#)



Kellogg's Honey Smacks **Salmonella** Outbreak over after 135 Sickened

Food Poison Journal - Sep 28, 2018

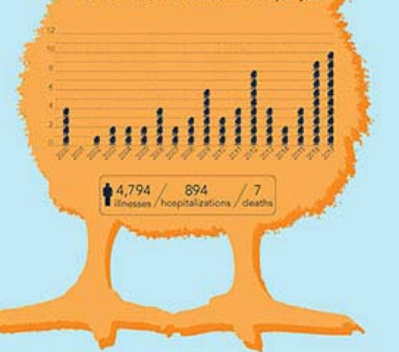
The FDA, CDC, along with state and local officials investigated a multi-state outbreak of **Salmonella** Mbandaka infections linked to Kellogg's ...



Don't play
chicken
with your
health

Since 2000,
70 **Salmonella**
outbreaks have been
linked to backyard poultry.

Number of **Salmonella** outbreaks per year



4,794 / 894 / 7
illnesses / hospitalizations / deaths

WASH YOUR HANDS

after handling backyard poultry

www.cdc.gov/features/salmonellapoultry



Public urged to throw out raw milk from dairy implicated in **Salmonella** outbreak

By Coral Beach on October 13, 2018

Healthy animals for healthy people and communities | mn.gov/bah

Drug-resistant salmonella from chicken sickens nearly 100

Share   



Updated: 4:20 PM EDT Oct 17, 2018

 CNN

 By Jen Christensen



At least 92 people in 29 states have been infected with a strain of multidrug-resistant salmonella after coming into contact with a variety of raw chicken products, the US Centers for Disease Control and Prevention said Wednesday. SOURCE: Ildi Papp/Shutterstock

(CNN) — At least 92 people in 29 states have been infected with a strain of multidrug-resistant salmonella after coming into contact with a variety of raw chicken products, the U.S. Centers for Disease Control and Prevention said Wednesday. Twenty-one of the sick patients have been hospitalized, though no deaths have

<https://www.foodsafetynews.com/2018/09/letter-from-the-editor-any-answers-to-the-years-persistent-questions/>

Letter From The Editor: Any answers to the year's persistent questions?

By **Dan Flynn** on September 23, 2018

OPINION

Every year at about this time—after it appears highly unlikely that our Colorado Rockies will take the National League West—I begin thinking about what type of year the rest of us are having.

Worldwide the year's top story is very likely to be South Africa's worst in the world listeriosis outbreak with 1,060 laboratory-confirmed cases of listeriosis, including 216 deaths.

But here in the good old US of A, it's been Salmonella, Salmonella and more Salmonella. But for the E. coli O157: H7 outbreak involving that hard to nail down Romaine Lettuce from Yuma growing region, it's all been Salmonella.

The federal Centers for Disease Control and Prevention (CDC) in Atlanta have recorded the following multi-state outbreaks of Salmonella, so far this year:

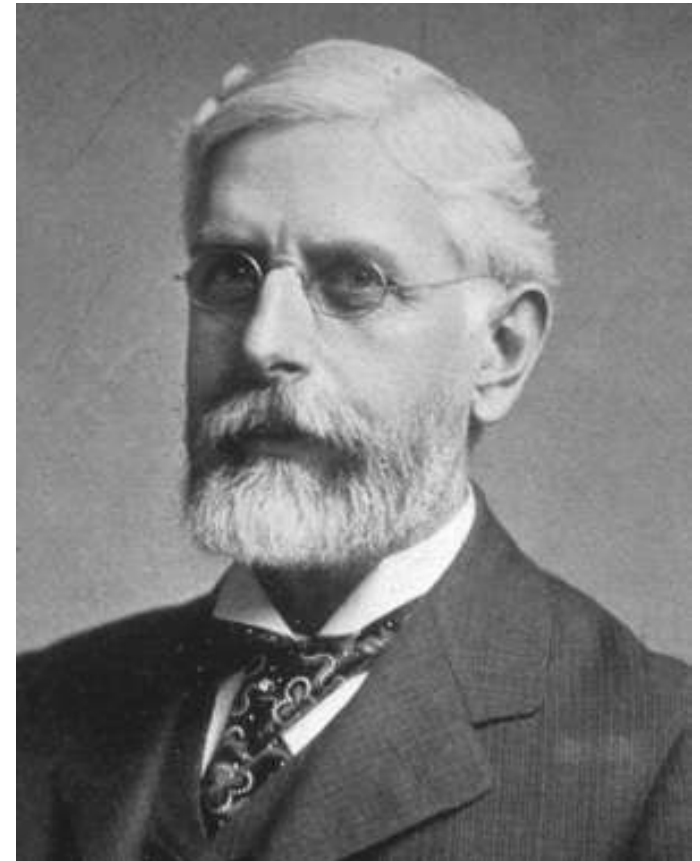
- [Gravel Ridge Farms Shell Eggs](#) – *Salmonella* Enteritidis
- [Chicken](#) – *Salmonella* I 4,[5],12:i-
- [Raw Turkey Products](#) – *Salmonella* Infections
- [Hy-vee Spring Pasta Salad](#) – *Salmonella* Sandiego
- [Kellogg's Honey Smacks Cereal](#) – *Salmonella* Mbandaka

Committee on Poultry and other Avian Species Reports

- **Egg Layers** – Food Safety, Foreign Animal Diseases, Areas of Concern
 - Salmonella Enteritidis (SE/FDA Egg Safety Rule Compliance) – 3.2/5 rating (moderate-high)
 - Group C or other non-SE serotypes resulting in egg recalls – 3.7/5 rating (moderate-high)
- **Broilers** - 2018 Major Non-Disease Issues
 - #2 – Increased Food Safety Regulations by USDA/FSIS
 - #3 – Biosecurity – Internal Programs, HPAI threat)
- **Turkeys** – Turkey Health Survey
 - Salmonella 4/5 rating, #7/24 disease issues
 - Food Safety is #1 Research Priority

Dr. Daniel E. Salmon

- USDA Bacteriologist (1850-1914)
- 2,500 antigenically distinct variants
 - Serovars or Serotypes
- Poultry – *Salmonella enterica*
 - Non-motile – host specific
 - *Salmonella Pullorum*, *Salmonella Gallinarum*
 - **Paratyphoid salmonellae**
 - *Salmonella Arizonae* (turkeys)



Salmonella Reservoirs, Control

- Many potential sources:

- Breeder flock / hatchery
- Environment
- Feed
- Rodents



- Control methods:

- Source from clean flocks
- Biosecurity
- Cleaning & disinfection
- Feed treatments
- Rodent control
- Vaccination

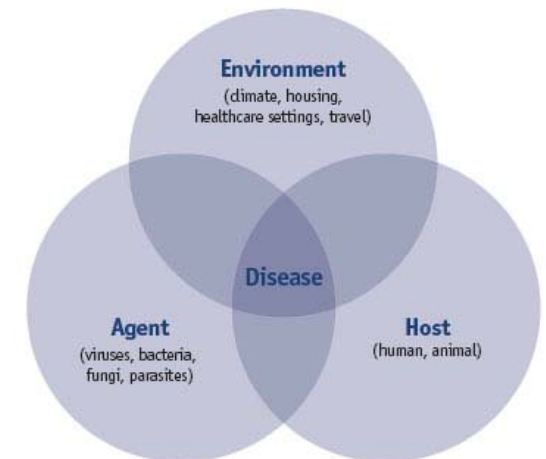
Disease Transmission

EGG TRANSMITTED (vertical)

- Examples:
 - Salmonella
 - Mycoplasma
- Sources:
 - ✓ Breeder Flock
 - ✓ Hatchery
 - ✓ People and equipment at these facilities

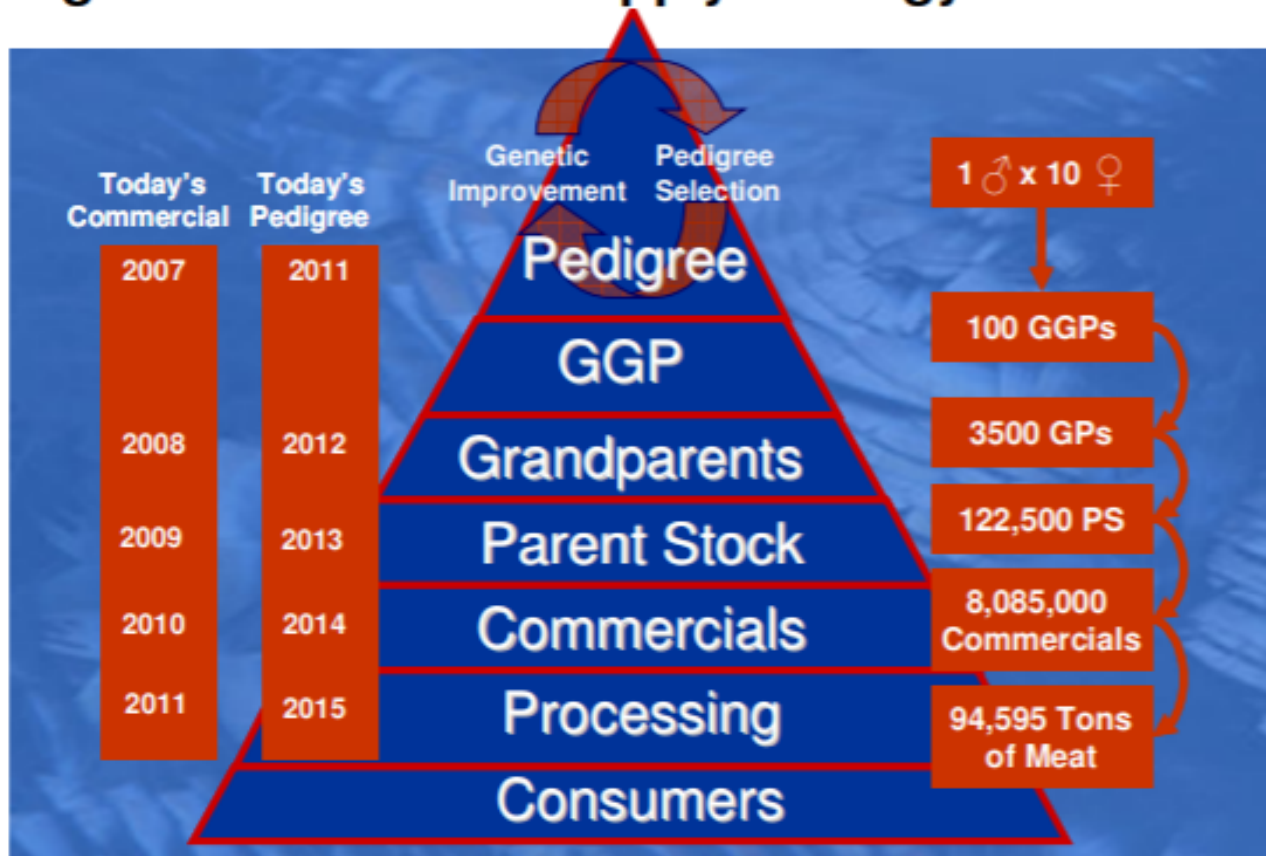
MECHANICALLY TRANSMITTED (horizontal)

- Examples:
 - Avian Influenza, Newcastle Disease
 - Salmonella
 - Mycoplasma
- Sources:
 - ✓ People
 - ✓ Equipment
 - ✓ Pests



Poultry Genetics, Pedigree Selection Pressure

Figure 8. Traditional Supply Strategy



Credit Aviagen Turkeys

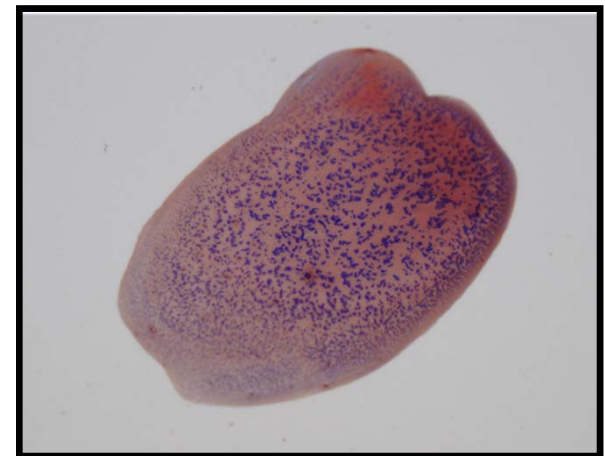
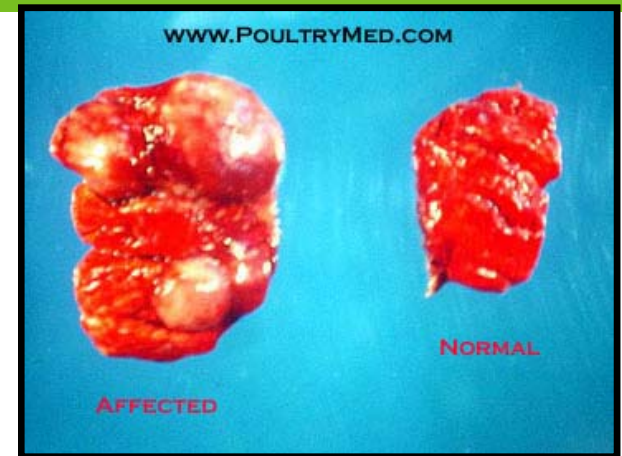


Salmonella – The Past

1950's Clifford Smith with group of fellow poultry men meet in Columbia, MO for a course to learn how to test birds for Pullorum. Pullorum a wide-spread blood disease that caused high death loss to baby chicks.

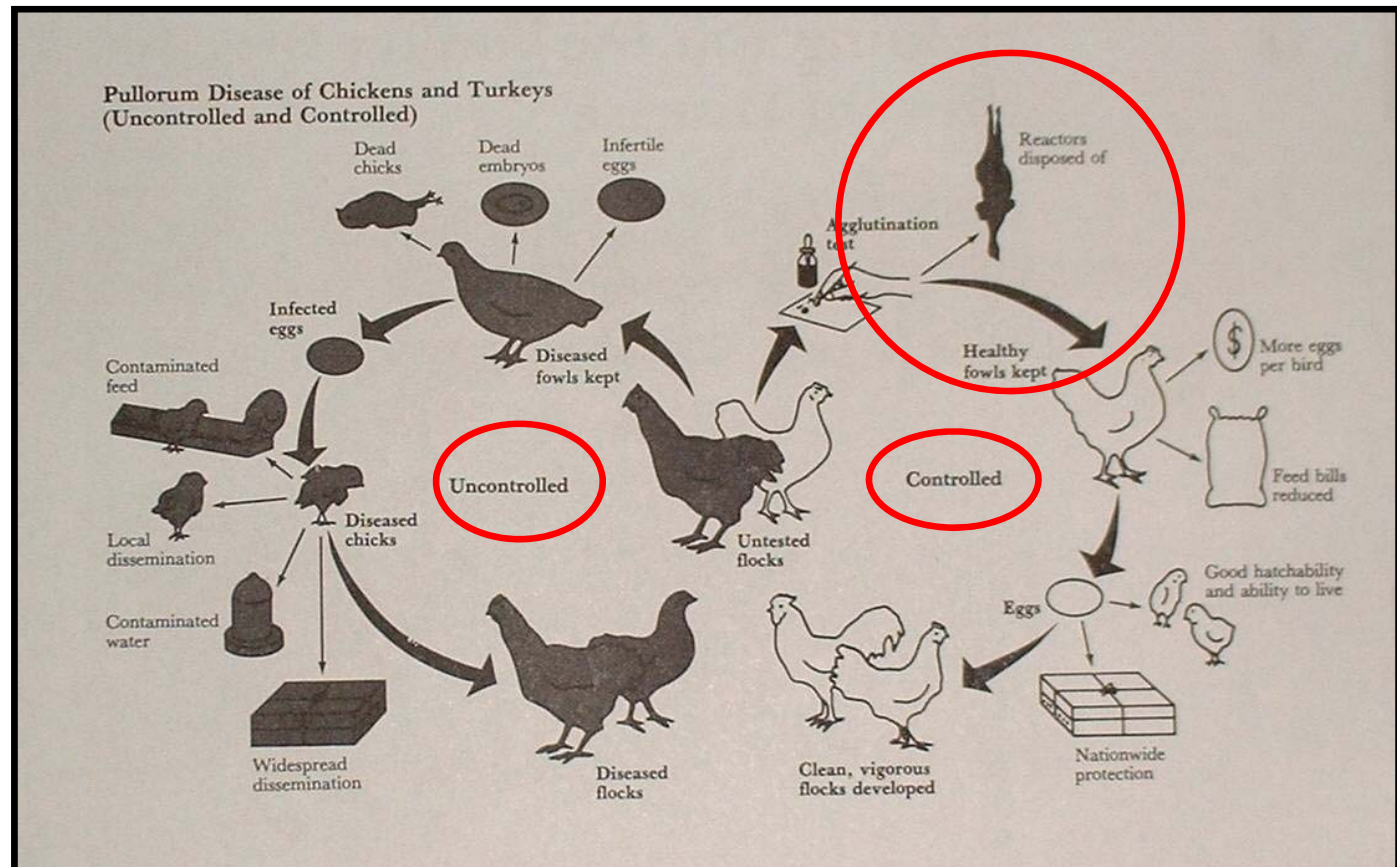
Salmonella Pullorum (Pullorum Disease) *Salmonella Gallinarum* (Fowl Typhoid)

- Important disease of US poultry in 1930's
- Species Affected:
 - Chickens are the natural hosts
 - Found in other avian species
- Characteristics:
 - Asymptomatic adult carriers
 - High chick mortality
 - White diarrhea, depression, dehydration



Salmonella Pullorum-Typhoid Disease Cycle

- SP & SG - Serogroup D1
- Rapid Whole Blood Tests (Plate Test) in the Field
- OIE Reportable Disease



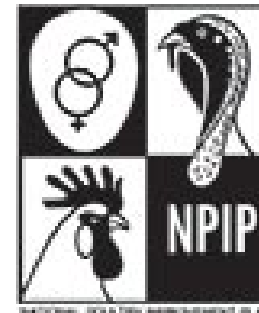
National Poultry Improvement Plan (NPIP)



National Poultry Improvement Plan

National Poultry Improvement Plan (NPIP)

- U.S. Department of Agriculture
 - Plan coordination, Laboratory materials
- Official State Agency
 - (Minnesota Board of Animal Health)
 - Supervise program
- Industry participants
 - Voluntary
 - Must agree to meet standards



**National Poultry
Improvement Plan**

NPIP Provisions

PART 145—NATIONAL POULTRY IMPROVEMENT PLAN FOR BREEDING POULTRY

Contents

Subpart A—General Provisions

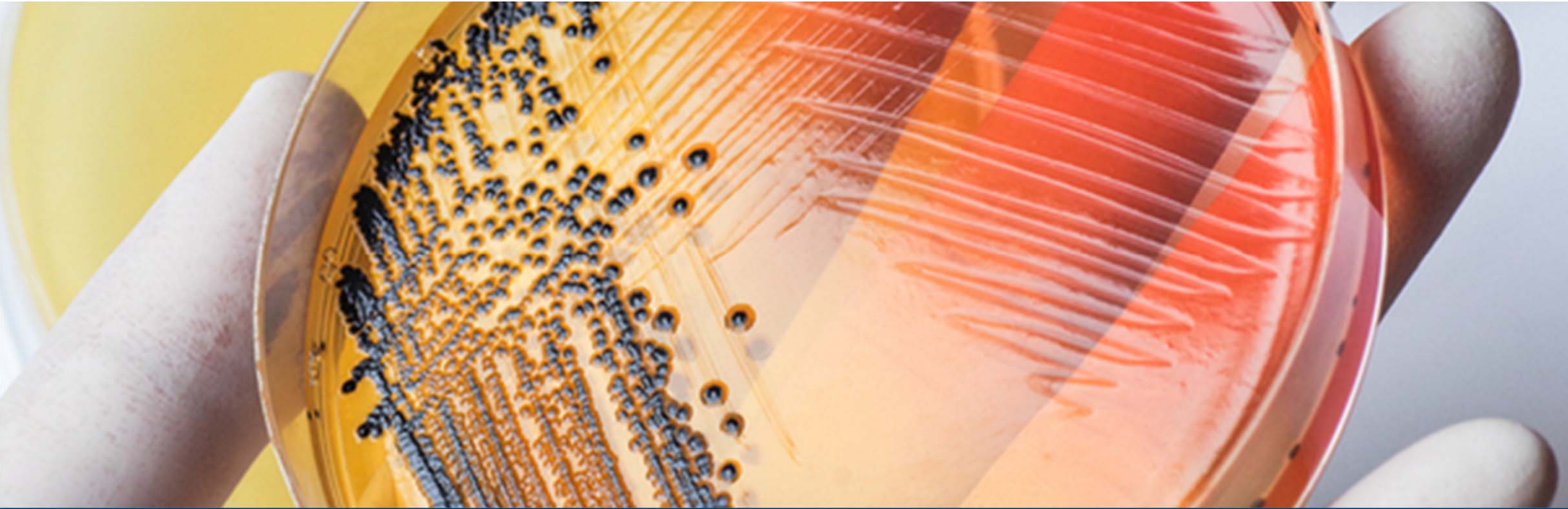
- §145.1 Definitions.
- §145.2 Administration.
- §145.3 Participation.
- §145.4 General provisions for all participants.
- §145.5 Specific provisions for participating flocks.
- §145.6 Specific provisions for participating hatcheries.
- §145.7 Specific provisions for participating dealers.
- §145.8 Terminology and classification; general.
- §145.9 Terminology and classification; hatcheries and dealers.
- §145.10 Terminology and classification; flocks, products, and States.
- §145.11 Supervision.
- §145.12 Inspections.
- §145.13 Debarment from participation.
- §145.14 Testing.
- §145.15 Diagnostic surveillance program for low pathogenic avian influenza.

Subpart B—Special Provisions for Multiplier Egg-Type Chicken Breeding Flocks and Products

- §145.21 Definitions.
- §145.22 Participation.
- §145.23 Terminology and classification; flocks and products.
- §145.24 Terminology and classification; States.

Subpart C—Special Provisions for Multiplier Meat-Type Chicken Breeding Flocks and Products

- §145.31 Definitions.



Salmonella – The Present

Salmonella in Shell Eggs

April 8, 1988

The Emergence of Grade A Eggs as a Major Source of Salmonella enteritidis Infections New Implications for the Control of Salmonellosis

Michael E. St. Louis, MD; Dale L. Morse, MD; Morris E. Potter, DVM; [et al](#)

JAMA. 1988;259(14):2103-2107. doi:10.1001/jama.1988.03720140023028

- During the 1980s, important cause of human illness
- Salmonella Enteritidis (SE) can be inside normal-appearing eggs
- Raw or lightly cooked (runny egg whites or yolks) eggs

**Egg-type Chicken breeding flocks with isolates of *Salmonella Enteritidis*
by phage type and by year 1989-2018**

Year	No. Flocks	Phage Type
1989	1	13A
1990	11	13A, 13, 8, 28
1991	12	13A, 13, 8
1992	10	Untypable,13A,8,28,34
1993	5	Untypable, 8, 2
1994	3	13A, 8
1995	2	13A, 28
1996	5	Untypable, RNDC, 13A,8,2
1997	2	8
1998	2	8
1999	1	13
2000	4	13, 8
2001	1	13
2002-2004	0	
2005	1	13
2006	1	34
2007	4	13, 8
2008	3	8
2009	0	
2010	3	8(2), 13
2011-2013	0	
2014	1	NA
2015-2017	0	
2018	3	NA

Salmonella Enteritidis (NPIP Annual Report – Dr. Denise Brinson-Heard)

Salmonella Enteritidis

HUFFINGTON POST

Egg Recall List UPDATE: 380 MILLION Eggs Recalled Over Salmonella

AP/Huffington Post

08/17/2010 01:20 pm ET | Updated Dec 06, 2017

Scroll down for the latest egg recall list and numbers affected by the Wright County Egg recall

380 million eggs coming from Wright County Egg of Galt, Iowa have been recalled in several states over potential salmonella contamination, linked to seven reported cases of Salmonella in Minnesota, eight in Colorado, 266 in California, and many more in other states.



INFECTIOUS DISEASES & CONDITIONS > FOOD SAFETY

CDC Investigating Multistate Outbreak of Salmonella Braenderup Infections Linked to Rose Acre Farms Shell Eggs

The Egg Rule at a Glance

SALMONELLA ENTERITIDIS (SE) PREVENTION MEASURES

Pullets: Must be raised under SE-monitored conditions, to include the following:

- Chicks are procured from SE-monitored breeder flocks that meet NPIP's standards for "U. S. Enteritidis Clean" status (9 CFR 145.23(d)) or equivalent;
- Pullet environment is tested for SE when pullets are 14-16 weeks old:
 - ✦ If environmental test is negative, no additional testing until the environmental test at 40-45 weeks of age.
 - ✦ If environmental test is positive, begin egg testing (see "Egg Sampling/Testing" on back) within 2 weeks of start of egg laying AND clean and disinfect the pullet environment following the procedures under "Cleaning and Disinfection" below.

Biosecurity: Take steps to ensure that there is no introduction or transfer of SE into or among poultry houses, to include (at a minimum):

- Limit visitors on the farm and in the poultry houses;
- Maintain practices that will protect against cross contamination when equipment is moved among poultry houses;
- Maintain practices that will protect against cross contamination when persons move between poultry houses;
- Prevent stray poultry, wild birds, cats, and other animals from entering poultry houses; and
- Do not allow employees to keep birds at home.


Rodents, Flies, and Other Pest Control:

- Monitor for rodents by visual inspection and mechanical traps or glueboards or another appropriate monitoring method and, when monitoring indicates unacceptable rodent activity within a house, use appropriate methods to achieve satisfactory rodent control;
- Monitor for flies by spot cards, Scudder grills, or sticky traps or another appropriate monitoring method and, when monitoring indicates unacceptable fly activity within a house, use appropriate methods to achieve satisfactory fly control; and
- Remove debris within a house and vegetation and debris outside a house that may provide harborage for pests.

Cleaning and Disinfection: Required at depopulation ONLY if that house had an SE-positive environmental or egg test during the life of the flock that was housed in the house prior to depopulation.

- Remove all visible manure;
- Dry clean the house to remove dust, feathers, and old feed; and
- Following cleaning, disinfect the house with spray, aerosol, fumigation, or another appropriate disinfection method.


Refrigeration: Hold and transport eggs at or below 45°F ambient temperature beginning 36 hours after time of lay.

September 2010 

1/30/2019

people and communities | mn.gov

Salmonella in Meat Birds



Salmonella Surprise: 574 Sick In Foster Farms Outbreak, CDC Says
NBCNews.com - May 27, 2014
And Foster Farms officials have consistently refused to recall the meat ... the Salmonella Heidelberg outbreak as well as the three Foster Farms ...
Tainted Foster Farms chicken still making people sick
KCRA Sacramento - May 28, 2014
[View all](#)

CDC-FSIS disclose Salmonella outbreak traced to raw turkey

By Dan Flynn on July 19, 2018

An outbreak of Salmonella Reading caused by raw turkey products has sickened 90 people in 26 states and hospitalization was already required in 44.4 percent of those cases, the federal Centers for Disease Control and Prevention (CDC) in Atlanta announced Thursday.



With the CDC announcement, the U.S. Department of Agriculture's Food Safety and Inspection Service (FSIS) said it is continuing to work with its federal partners to monitor a Salmonella Reading outbreak that may be associated with raw turkey products.

Poultry News



90 cases of Salmonella Reading reported across 26 states
20 July 2018

CDC and public health and regulatory officials in several states are investigating a multistate outbreak of multidrug-resistant Salmonella Reading infections linked to raw turkey products; the US Department of Agriculture's Food Safety and Inspection Service (USDA-FSIS) is monitoring the outbreak

PEW

TOPICS PROJECTS FEATURES ABOUT GET INVOLVED SEARCH

To Reduce Salmonella Contamination in Chicken, Target the Problem on Farms

Poultry companies can do more to combat this deadly bacterium

ARTICLE October 3, 2018 By: Sandra Eskin Topics: Food & Drug Safety & U.S. Policy Projects: Safe Food Project Read time: 2 min

Salmonella in Baby Poultry

After you touch ducklings or chicks, wash your hands so you don't get sick!



- Contact with live poultry (chicks, chickens, ducklings, ducks, geese, and turkeys) can be a source of human *Salmonella* infections.
- *Salmonella* germs can cause a diarrheal illness in people that can be mild, severe, or even life threatening.
- Chicks, ducklings, and other live poultry can carry *Salmonella* germs and still appear healthy and clean.
- *Salmonella* germs are shed in their droppings and can easily contaminate their bodies and anything in areas where birds live and roam.

Protect Yourself and Your Family from Germs

DO:

- Wash your hands thoroughly with soap and water right after touching live poultry or anything in the area where they live and roam.
- Adults should supervise hand washing for young children.
- If soap and water are not readily available, use hand sanitizer until you are able to wash your hands thoroughly with soap and water.
- Clean any equipment or materials associated with raising or caring for live poultry outside the house, such as cages or feed or water containers.

DON'T:

- Don't let children younger than 5 years of age, elderly persons, or people with weak immune systems handle or touch chicks, ducklings, or other live poultry.
- Don't let live poultry inside the house, in bathrooms, or especially in areas where food or drink is prepared, served, or stored, such as kitchens, or outdoor patios.
- Don't snuggle or kiss the birds, touch your mouth, or eat or drink around live poultry.



- Live poultry can be a source of Salmonella
- Salmonella germs can cause a diarrheal illness in people
- Mild, Severe, Life Threatening
- Chicks, ducklings, live poultry carry Salmonella and still appear healthy and clean
- Salmonella is shed in droppings and contaminates areas where birds live/roam



Sample Collection for *Salmonella* testing

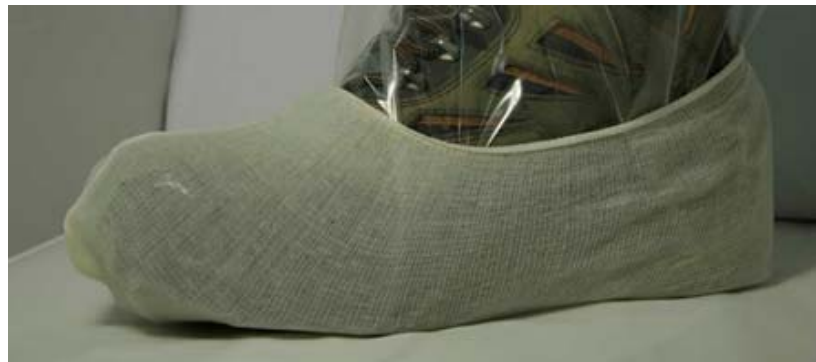
- Environmental Samples:

- Pre-placement swabs
- Bootie samples
- Hatchery debris (fluff)
- Chick/poult papers



- Bird Cultures:

- Cloacal swabs
- Dead-in-shells
- Bird/tissues



Minnesota's Turkey Industry



Dr. Ben S. Pomeroy
University of Minnesota

- University Research
- State Regulations
- Pro-Active Testing Programs
- Sharing of test information
- Primary Breeder Meetings
- Collaboration

Minnesota Turkey Industry Testing Programs

-Voluntary, Annual Renewal, OSA Supervision-

- Primary Breeders – Parent Stock
- Brooder Building Pre-Placement
- Environmental Tests
 - Beginning, Mid-Lay, End-of-Lay
- Hatchery Testing
- Chick/Poult Box Papers
- 10 Day Mortality

COOPERATIVE SALMONELLA REDUCTION PROGRAM

A STATEMENT OF **COOPERATION** FOR
THE **CONTROL** OF SALMONELLA IN
TURKEYS BETWEEN THE BREEDER HEN
COMMITTEE OF THE **MINNESOTA** TURKEY
GROWER ASSOCIATION AND THE
PRIMARY BREEDER COMPANIES
(exchange of reports began in 1981)

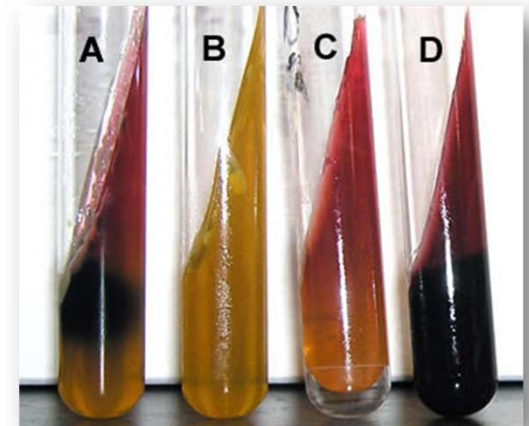
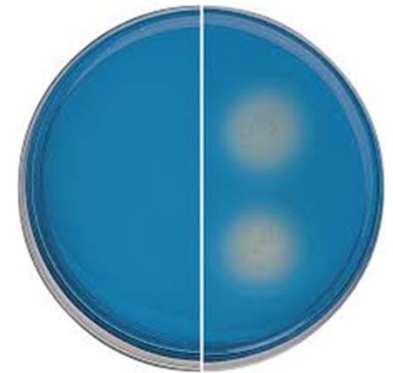
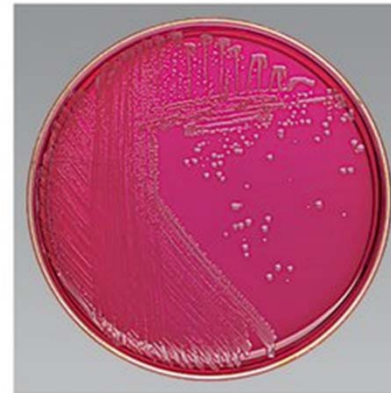
(December 1979)

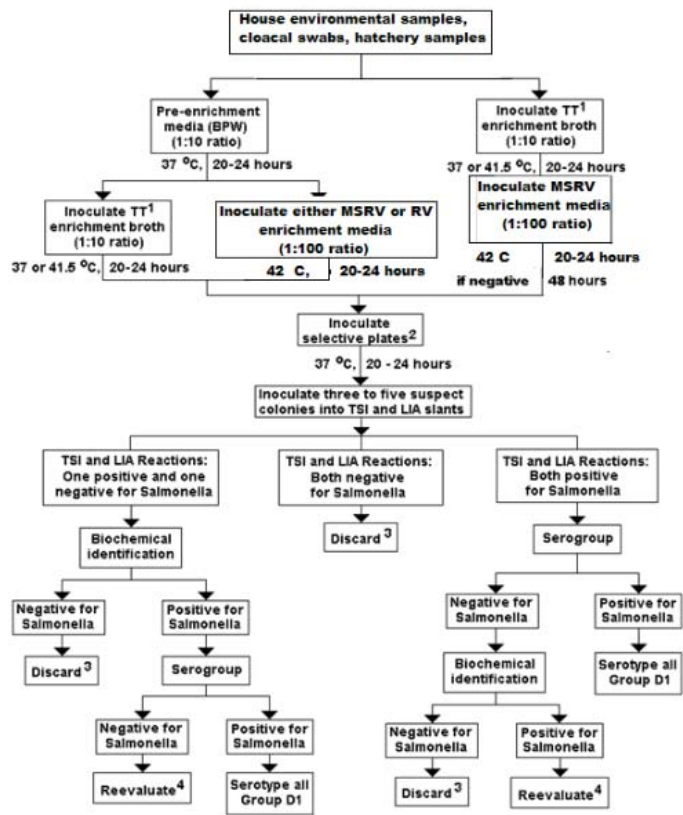
2007 Cooperative Report



Salmonella – The Future, The Challenges

- Improved Tubed and Plated Media to assist enrichment process
 - Brilliant Green / Novobiocin
 - XLT4
 - MSRV
- NPIP Program Standards





1. Tetrathionate enrichment broth, e.g., Rappaport-Vassiliades (RV) or modified semisolid RV (MSRV).
2. Selective plates such as Brilliant Green Novobiocin (BGN) or xylose-lysine tergitol 4 (XLT 4).
3. Reevaluate if epidemiologic, necropsy, or other information indicates the presence of an unusual strain of Salmonella.
4. If biochemical identification and serogroup procedures are inconclusive, restreak original colony onto non-selective plating media to check for purity. Repeat biochemical and serology tests.

Illustration 2. Culture procedures for house environmental samples, cloacal swabs, and hatchery samples



United States
Department of
Agriculture

Animal and Plant
Health Inspection
Service

Veterinary
Services

January 2017



NATIONAL POULTRY IMPROVEMENT PLAN PROGRAM STANDARDS

January 2017



NATIONAL POULTRY IMPROVEMENT PLAN

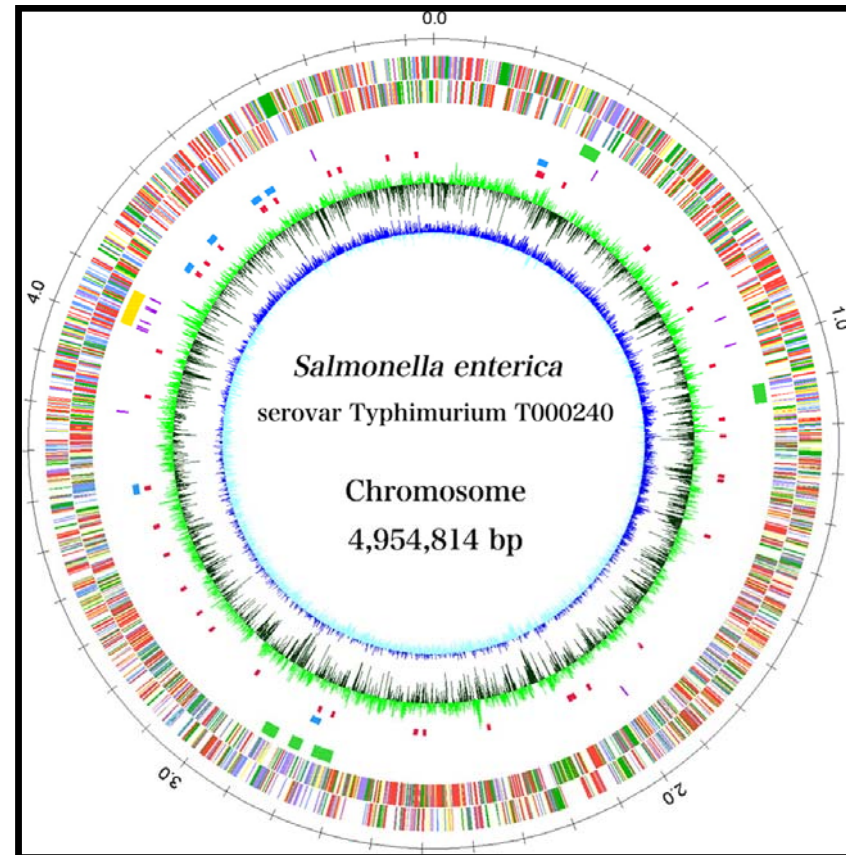
Testing

NPIP Approved Rapid Systems



1/30/2019

Healthy animals for healthy people and communities | mn.gov/bah



29

Biosecurity, Flock Sanitation, Hatchery Sanitation

-is it good enough?



Challenges to Salmonella Control

- Vertically integrated production systems may help with control strategies
- Confidentiality – testing, reporting, collaboration
 - Public vs. Private
 - Sharing of isolates, reporting without penalty
- Communication to the consuming public about what defines an “outbreak”
- How to deliver the message of overall food safety
- Over-extension of monitoring programs, regulations.....serotypes matter

More Challenges

- *Salmonella* vaccination (live AND killed) reduce *Salmonella* in progeny
- Serotype shift so autogenous vaccines with yearly changes are needed
- Difficult to measure success...such as water acidifiers, probiotics, etc.
- Qualitative versus a quantitative load
- Not *Salmonella* elimination programs, *Salmonella* reduction programs
- Measuring success requires a lot of sampling.....expensive

Take Home Message

- ***Salmonella***

- Ever changing, challenging situation
- Evaluation of testing and sampling strategies
- Evaluation of Control Strategies

- **On-Going Discussion**

- More Communication
- Testing, Surveillance, Reporting
- Confidentiality, Data Use, Goals

None of Us
Alone are as
Good as All of
Us Together

Acknowledgements

- Dr. Shauna Voss – Minnesota Board of Animal Health
- Dr. Doug Waltman – Georgia Poultry Laboratory
- Dr. Denise Brinson-Heard – National Poultry Improvement Plan (NPIP)
- Layer, Broiler and Turkey Veterinarians and Producers

THANK YOU! THANK YOU! THANK YOU!

Questions?