

NPIP Salmonella Update 2024

History of Salmonella and the NPIP

National Poultry Improvement Plan

- NPIP established **1935** by an act of Congress.
- NTIP established **1943** under USDA.
- Based on the recommendation of the **1970** National Plans Conference, the two Plans were consolidated into one NPIP.



National Poultry Improvement Plan

1958 – a tube agglutination test for *S. Typhimurium* was added to the auxiliary provisions.

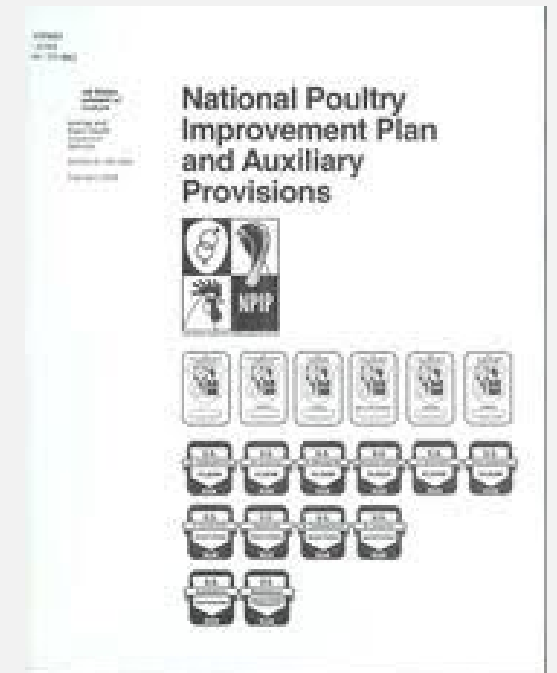
- Voluntary approach for the control of *Typhimurium* without an official program for turkey breeding flocks.
- Remained until 2000 (voted to remove by delegates at the 1998 biennial conference).

1976 – U.S. Salmonella Monitored was changed to U.S. Sanitation Monitored egg- and meat-type chickens.

Turkey industry removed all programs that involved *Salmonella* control or monitoring.

NPIP “white book”

- Contained CFR 145-147
 - 1985, 1989, 1993, 1994, 1996, 1997, 2000, 2002, 2004, 2007, 2009, 2011
- CFR and Program Standards were separated
 - 2014, 2017, 2019, 2024?
- These dates represent the official revisions of the Plan; the proposed changes had been submitted and approved at an earlier biennial conference.



NPIP Salmonella Classifications

Plan Dates	Subpart B (egg-type)	Subpart C (meat-type)	Subpart D (turkeys)	Subpart E (WEGBY)	Subpart G (Primary egg-type)	Subpart H (Primary meat-type)
1985	Sanitation Monitored	Sanitation Monitored	-	-		

The OSA may monitor the effectiveness of the sanitation program by:

- Culture the surface of cased eggs periodically for fecal coliforms.
- Culture a sample of dead-in-shell eggs periodically from each breeding flock for coliforms.



JAMA 1989 Apr 14;261(14):2064-5

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

*St Louis ME, Morse DL, Potter ME, DeMelfi TM, Guzewich JJ, Tauxe RV, Blake PA
Enteric Diseases Branch, Centers for Disease Control, Atlanta, GA 30333*

Salmonella Enteritidis (SE)

- **1976 - 1986**, SE infections increased more than sixfold in the northeastern United States.
- **January 1985 - May 1987**, 65 foodborne outbreaks of SE were reported in the Northeast that were associated with 2,119 cases and 11 deaths.

Salmonella Enteritidis (SE)

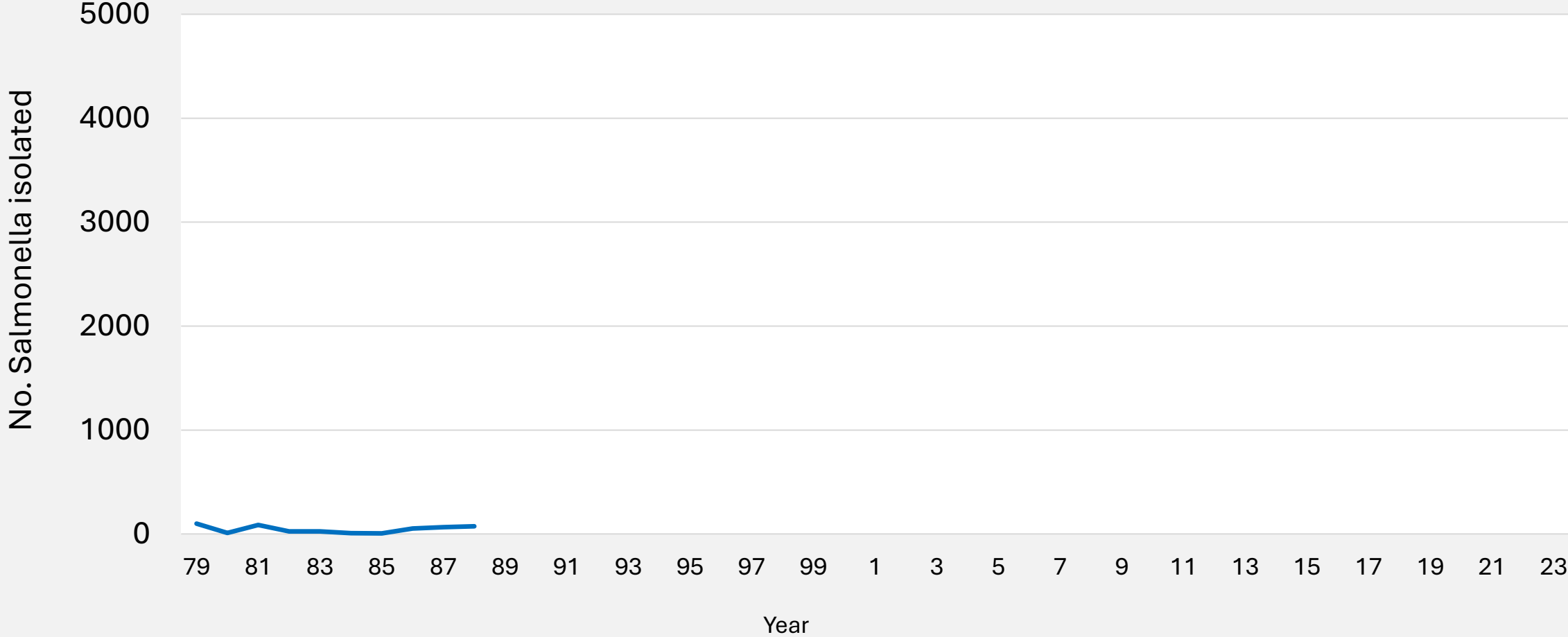
- The epidemic rise in SE infections due to Grade A shell eggs is unlike past problems of salmonellosis associated with cracked or soiled eggs and raises the possibility of trans-ovarian contamination of eggs with SE.
- New techniques may therefore be needed to control resurgent egg-associated salmonellosis in the United States.

Salmonella Enteritidis (SE)

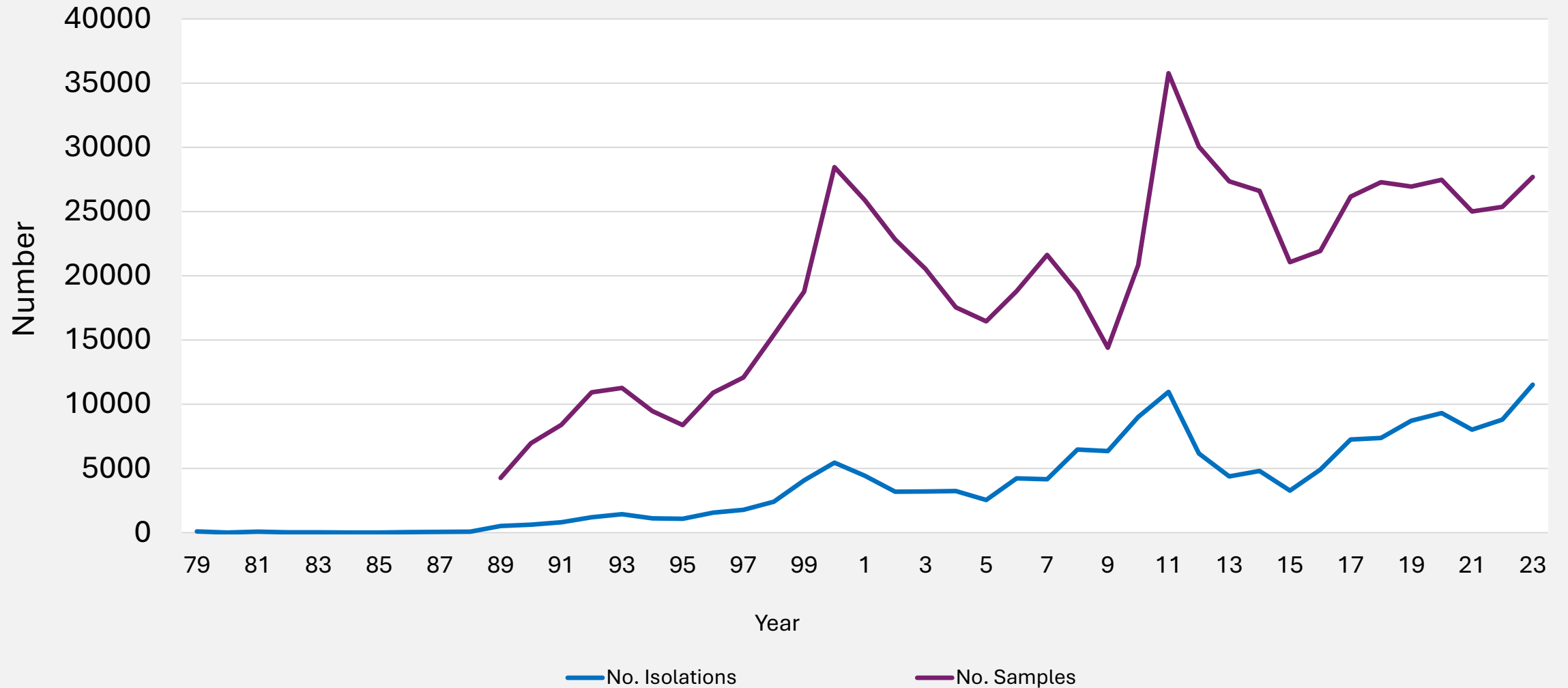
1988 – 1990

- Northeastern Conference on Avian Diseases developed a Voluntary Model State Program for Salmonella Enteritidis.
- FDA and USDA held a National Public meeting on Salmonella Enteritidis.
- USDA passed a rule, Poultry Affected by Salmonella Enteritidis.
- Pennsylvania Pilot Project.

No. Salmonella isolated at the GPLN, 1979 - 1988



No. samples cultured and positive for Salmonella at the GPLN



NPIP Salmonella Classifications

Plan Dates	Subpart B (egg-type)	Subpart C (meat-type)	Subpart D (turkeys)	Subpart E (WEGBY)	Subpart G (Primary egg-type)	Subpart H (Primary meat-type)
1985	Sanitation Monitored	Sanitation Monitored	-	-		
1989	Sanitation Monitored	Sanitation Monitored	Sanitation Monitored, Turkeys	-		
1993	Sanitation Monitored	Sanitation Monitored	Sanitation Monitored, Turkeys	-		
1994	S. Enteritidis Monitored	Sanitation Monitored	Sanitation Monitored, Turkeys	-		

U.S. Sanitation Monitored

Egg-type Chickens

- 1989** (changed from 1985)
- Environmental samples collected from flock after 4 months of age.
 - 300 birds tested with pullorum antigen; all reactors up to 25 birds.
 - Minimum of 30 dead-germ eggs taken monthly from randomly selected flock.
 - Examined for Group D Salmonella. Group D cultures shall be serotyped.
 - Flock loses classification if SE isolated from reactor birds or dead-germ eggs.

Meat-type Chickens

- 1989**
- The OSA may monitor the effectiveness of the sanitation program by:
 - Culture the surface of cased eggs periodically for fecal coliforms.
 - Culture a sample of dead-in-shell eggs periodically from each breeding flock for coliforms.

U.S. Sanitation Monitored, Turkeys

1989 - 2019

- Hatchery debris and/or sample of dead poult from each breeding flock are cultured for Salmonella.
- Birds are placed in a building that has been cultured for Salmonella.
- Environmental samples cultured for Salmonella from each flock at 12-20 weeks of age and 35-50 weeks of age.

U.S. Sanitation Monitored

Egg-type Chickens

1993 (modified from 1989)

- Environmental samples collected from flock after 4 months of age **and every 30 days thereafter.**
- 300 birds tested with pullorum antigen; all reactors up to 25 birds.
- **If SE isolated from the environment, 60 birds submitted for culture for SE.**
- Positive Group D cultures shall be serotyped.
- Flock loses classification if SE isolated from birds.

Meat-type Chickens

1993 - 2014

- Environmental samples collected and cultured for Salmonella after 4 months of age and every 90 days thereafter.
- “examine for Salmonella”
- Flocks found infected with a paratyphoid Salmonella may vaccinate with an autogenous bacterin.

U.S. S. Enteritidis Monitored Egg-type Chickens

1994 - 2000

- Changed name from Sanitation Monitored
- Environmental samples collected at **2-4 weeks of age** and every 30 days thereafter.
- 300 birds tested with PT antigen; all reactors up to 25 are submitted.
- If SE isolated from environmental sample, 60 birds submitted.
- Positive Group D cultures shall be serotyped.
- Flock loses classification if SE isolated from birds.
- **Federally licensed SE bacterin may be used in multiplier breeding flocks that are negative for SE.**

NPIP Salmonella Classifications

Plan Dates	Subpart B (egg-type)	Subpart C (meat-type)	Subpart D (turkeys)	Subpart E (WEGBY)	Subpart G (Primary egg-type)	Subpart H (Primary meat-type)
1996	S. Enteritidis Monitored	Sanitation Monitored S. Enteritidis Clean	Sanitation Monitored, Turkeys	-		
1997	S. Enteritidis Monitored	Sanitation Monitored S. Enteritidis Clean Salmonella Monitored	Sanitation Monitored, Turkeys	-		

U.S. S. Enteritidis Clean

Primary Meat-type Chickens (Subpart C)

1996 - 2004

- “certified free of SE”
- Environmental samples collected at 4 months of age and every 30 days thereafter.
- 300 birds tested with PT antigen; all reactors up to 25 are submitted.
- If SE isolated from environmental sample, **25 birds submitted.**
- Positive Group D cultures shall be serotyped.
- Flock loses classification if SE isolated from birds.

U.S. Salmonella Monitored Meat-type Chickens (Subpart C)

1997 - 2004

- Environmental samples (meconium, chick papers) cultured for Salmonella from the hatchery every 30 days.
- Environmental samples from farm cultured at 4 months of age and every 30 days thereafter; cultured for Salmonella.
- Flocks may be vaccinated with a paratyphoid vaccine.

NPIP Salmonella Classifications

Plan Dates	Subpart B (egg-type)	Subpart C (meat-type)	Subpart D (turkeys)	Subpart E (WEGBY)	Subpart G (Primary egg-type)	Subpart H (Primary meat-type)
2000	S. Enteritidis Monitored	Sanitation Monitored S. Enteritidis Clean Salmonella Monitored	Sanitation Monitored, Turkeys	-		
2002	S. Enteritidis Clean	Sanitation Monitored S. Enteritidis Clean Salmonella Monitored	Sanitation Monitored, Turkeys	-		

U.S. S. Enteritidis Clean Egg-type Chickens

- **2002 – 2019** (Subpart B)
- Changed name from S. Enteritidis Monitored.
- All sampling and testing requirements are the same.

NPIP Salmonella Classifications

Plan Dates	Subpart B (egg-type)	Subpart C (meat-type)	Subpart D (turkeys)	Subpart E (WEGBY)	Subpart G (Primary egg-type)	Subpart H (Primary meat-type)
2004	S. Enteritidis Clean	Sanitation Monitored S. Enteritidis Clean Salmonella Monitored	Sanitation Monitored, Turkeys	-		
2007	S. Enteritidis Clean	Sanitation Monitored	Sanitation Monitored, Turkeys	-	S. Enteritidis Clean	S. Enteritidis Clean Salmonella Monitored
2009	S. Enteritidis Clean	Sanitation Monitored	Sanitation Monitored, Turkeys	-	S. Enteritidis Clean	S. Enteritidis Clean Salmonella Monitored

U.S. S. Enteritidis Clean

Primary Egg-type Chickens (Subpart G)

2007 - 2019

- Classification added to new Subpart G.
- Sample collection and testing requirements are the same as for S. Enteritidis Clean Subpart B

U.S. S. Enteritidis Clean

Primary Meat-type Chickens (Subpart H)

2007 - 2019

- Classification moved from Subpart C to new Subpart H
- Sample collection and testing are the same from Subpart C.
- Guidelines for reinstating pedigree, experimental or GGP flocks.

U.S. Salmonella Monitored

Primary Meat-type Chickens (Subpart H)

2007 - 2019

- Classification moved from Subpart C to Subpart H.
- Sample collection and testing requirements are the same from Subpart C

• 2011

- If Salmonella not isolated from birds or environmental testing, flock may be considered “Salmonella negative”

NPIP Salmonella Classifications

Plan Dates	Subpart B (egg-type)	Subpart C (meat-type)	Subpart D (turkeys)	Subpart E (WEGBY)	Subpart G (Primary egg-type)	Subpart H (Primary meat-type)
2011	S. Enteritidis Clean	Sanitation Monitored	Sanitation Monitored, Turkeys	-	S. Enteritidis Clean	S. Enteritidis Clean Salmonella Monitored
2014	S. Enteritidis Clean	Sanitation Monitored Salmonella Enteritidis Monitored	Sanitation Monitored, Turkeys	Salmonella Monitored	S. Enteritidis Clean	S. Enteritidis Clean Salmonella Monitored

2014 Subpart I Salmonella Monitored

U.S. Salmonella Enteritidis Monitored

Meat-type Chickens

2014 - 2019

- Environmental samples collected from flocks at 16-18 weeks and 40-45 weeks of age and cultured for group D Salmonella.
- The samples shall be examined bacteriologically for group D Salmonella at an authorized laboratory, and cultures from group D positive samples shall be serotyped.
- 4 actions must be taken with respect to the results.

U.S. Salmonella Monitored Subpart E

2014, 2017, 2019 (modified)

- Collect minimum of 5 environmental samples (hatchery debris, swabs from hatchers, setters, hatchery environment, hatchery equipment, sexing tables and belts, meconium, chick box papers, hatching trays, or chick transfer devices) from hatchery at least every 30 days. Samples will be examined bacteriologically for Salmonella.
- Annual environmental samples from each pullet and breeder farm. Samples will be examined bacteriologically for Salmonella.
- If Salmonella isolated, a qualified poultry health professional will review results, evaluate the program, and develop appropriate and practical Salmonella intervention measures.

U.S. Salmonella Monitored Subpart I

- **2014 - 2019**
- Collect environmental samples (meconium, box liner paper) from hatchery every 30 days.
- Collect environmental samples from each flock at 4 months of age and every 30 days thereafter.
- Authorized laboratory for Salmonella shall examine the samples bacteriologically.
- Flocks may be vaccinated with a paratyphoid vaccine.

NPIP Salmonella Classifications

Plan Dates	Subpart B (egg-type)	Subpart C (meat-type)	Subpart D (turkeys)	Subpart E (WEGBY)	Subpart G (Primary egg-type)	Subpart H (Primary meat-type)
2017	S. Enteritidis Clean	Sanitation Monitored Salmonella Enteritidis Monitored	Sanitation Monitored, Turkeys	Salmonella Monitored	S. Enteritidis Clean	S. Enteritidis Clean Salmonella Monitored
2019	S. Enteritidis Clean	Sanitation Monitored Salmonella Enteritidis Monitored	Sanitation Monitored, Turkeys	Salmonella Monitored	S. Enteritidis Clean	S. Enteritidis Clean Salmonella Monitored

2014, 2017, 2019 Subpart I **Salmonella Monitored**

2019 Subpart J **Salmonella Monitored**

U.S. Salmonella Monitored Subpart J

- **2019**
- Collect minimum of 5 environmental samples (chick papers, hatching trays, and chick transfer devices) from hatchery every 30 days.

U.S. S. Enteritidis Clean

2019

- Removed requirement for 300 birds tested with PT antigen under SE Clean classification

NPIP Approved Tests

1. Rapid Chek©Select TMSalmonella Test Kit, Romer Labs
2. ADIAFOOD Rapid Pathogen Detection System for Salmonella spp., AES Chemunex
3. DuPont Qualicon BAX Polymerase Chain Reaction (PCR)-based assay for Salmonella 1 and 2
4. Applied Biosystems TaqMan® Salmonella Enteritidis Real-Time PCR assay for the detection of Salmonella Enteritidis. Life Technologies Corporation.
5. MicroSEQ Salmonella Species Detection Kit, Life Technologies Corporation
6. ANSR Salmonella Test, Neogen Corporation
7. Reveal 2.0 Group D1 Salmonella (Including SE) Kit, Neogen Corporation
8. DNABLE Salmonella Detection Kit, EnviroLogix, Inc
9. Qiagen mericon® Salmonella spp. real-time PCR kit-Qiagen
10. IDEXX RealPCR Salmonella DNA spp. DNA reagents. IDEXX Laboratories
11. GENE UP Salmonella spp Assay (48-hour protocol). bioMerieux.
12. VIDAS Salmonella spp Phage Technology Assay. bioMerieux.
13. BioChek Salmonella spp DNA Test - Salmonella qPCR Reagents.
14. Clear Safety Salmonella, NGS Based Test. Clear Labs Inc. (for use in positive/negative Salmonella detection only, not approved method for serotyping at this time).

NPIP Salmonella Sample Collection, Isolation, and Identification Methods

1985

Bacteriological examination of Salmonella reactors

Collection of environmental samples (feces, litter, dust) and cloacal samples (each bird or minimum of 500/flock)

Bacteriological culturing of eggshells for colon bacilli

- Removed 2019

Procedures to determine status and effectiveness of sanitation monitored program

- Removed 2019

NPIP Salmonella Sample Collection, Isolation, and Identification Methods

1993 Added Drag swabs and nest boxes

First mention of BGN and XLT4

1994 Illustration 1 – Organ tissues PT reactors

Illustration 2 – Environmental, organ, and intestinal samples

Addition of DSE

Turkey samples cultured differently (no DSE)

Salmonella Workshop Resolution

Be it therefore resolved, that one or more wet lab training sessions be organized, through the urging and auspices of the NPIP, in conjunction with the poultry industry; and to be held in conjunction with regional or national avian disease conference.

NPIP Salmonella Workshops

- First workshop held in Georgia 1995
- Workshops held annually
- Some years more than one workshop
- Held in Georgia, Arkansas, and Indiana

Dr. Ed Mallinson



NPIP Salmonella Sample Collection, Isolation, and Identification Methods

1996 Added procedure for culturing cull chicks

1997 Added chick box papers

2002 Combined PT Reactors and SE birds into Illustration 1.

Serogroup all isolates identified as salmonellae and serotype all serogroup D1 isolates.

Added Chick meconium sample

Added BPW pre-enrichment procedure

Revised Illustration 2 for TT/DSE and BPW/TTH,RV,MSRV

NPIP Salmonella Sample Collection, Isolation, and Identification Methods

- 2007** combined chickens and turkeys for isolation and identification from birds.
- 2014** Program Standards separate from CFR
 - TT/MSRV replaces TT/DSE
 - Chicken and turkey environmental section combined
 - Added shoe cover swabs

NPIP Salmonella Sample Collection, Isolation, and Identification Methods

2019

Laboratory procedure recommended for the bacteriological examination of Salmonella from birds.

Procedures for collection, isolation, and identification of Salmonella from house environmental samples, cloacal swabs, and hatchery samples

- Revised Illustration 2

National Poultry Improvement Plan 2024 -

- Proposed changes from 2022 approved.
- Streamline that approval process.
- USDA FSIS Proposed Rule
- NPIP proposed commercial Salmonella classification

Thank you!

I would like to thank Andy Rhorer
(NPIP Senior Coordinator 1991 – 2011)
for his help in putting this presentation together.

Salmonella Enteritidis (SE)

- **August 25, 1988** – Proposed Voluntary Model State Program, Salmonella enteritidis Quality Assurance. Northeastern Conference on Avian Diseases.
- **September 15, 1988** - National Public Meeting on Salmonella enteritidis sponsored by FDA and USDA.
- **February 16, 1990** – USDA Interim Rule. Poultry Affected by Salmonella enteritidis. Final Rule January 30, 1991.
- **June 1, 1990** – Northeast Conference on Avian Diseases. Model State Program for Salmonella enteritidis serotype enteritidis control.

Salmonella Enteritidis (SE)

Changes approved at the 1986 and 1988 Biennial Conferences were published in the Federal Register June 5, 1989

1990 - Pennsylvania Pilot Project

1990 – 1994 - USDA SE Task Force and Traceback regulation

NPIP Salmonella Sample Collection, Isolation, and Identification Methods

1994

147.10 Bacteriological examination of egg-type breeding flocks with SE positive environments

147.11 Bacteriological examination of Salmonella

- All isolates culturally identified as salmonellae should be serogrouped or serotyped

147.12 Collection of environmental samples (feces, litter, dust) and cloacal samples (each bird or minimum of 500/flock)

- Illustration 1 – Organ tissues PT reactors
- Illustration 2 – Environmental, organ, and intestinal samples
- Addition of DSE
- Turkey samples cultured differently (no DSE)

NPIP Salmonella Sample Collection, Isolation, and Identification Methods

2014 Separated CFR from Program Standards

Subpart B

- (1) Laboratory procedure recommended for the bacteriological examination of egg-type and meat-type breeding flocks with salmonella enteritidis positive environments.
- (2) Laboratory procedure recommended for the bacteriological examination of salmonella from birds
- (3) Procedures for collection, isolation, and identification of Salmonella from house environmental samples, cloacal swabs, and hatchery samples.
 - TT/MSRV replaces TT/DSE
 - Revised Approved rapid methods for the detection of Salmonella
 - Chicken and turkey combined
 - Added shoe cover swabs

NPIP Salmonella Sample Collection, Isolation, and Identification Methods

2017

Standard B

- (1) Laboratory procedure recommended for the bacteriological examination of egg-type and meat-type breeding flocks with *Salmonella enteritidis* positive environments.
- (2) Laboratory procedure recommended for the bacteriological examination of salmonella from birds
- 3) Procedures for collection, isolation, and identification of *Salmonella* from house environmental samples, cloacal swabs, and hatchery samples.

National Poultry Improvement Plan

1974 – split into Subparts

- B Egg-type Chickens
- C Meat-type chickens
- D Turkeys
- E Waterfowl, exhibition, game, backyard flocks (WEGBY)

2000 – added Subpart F

2007 – added Subparts G and H

2011 – added Subpart I

2019 – added Subpart J

Resolution at the 1994 Biennial Conference

- Whereas, it has been established that a lack of uniformity exists between industry and official State laboratories in the methods used for the isolation of Salmonella, and
- Whereas, it has been established that certain culture methods are more reliable for the dependable detection of Salmonella, and
- Whereas, ...
- Whereas, ...
- Be it therefore resolved, that one or more wet lab training sessions be organized, through the urging and auspices of the NPIP, in conjunction with the poultry industry; and to be held in conjunction with regional or national avian disease conference.

NPIP Salmonella Sample Collection, Isolation, and Identification Methods

2002

- Combined PT Reactors and SE birds into Illustration 1.
- Serogroup all isolates identified as salmonellae and serotype all serogroup D1 isolates.
- Added Chick meconium sample
- Added BPW pre-enrichment procedure
- Revised Illustration 2 for TT/DSE and BPW/TTH,RV,MSRV

National Turkey Improvement Plan

- Established **1943** under USDA.
- Based on the recommendation of the **1970** National Plans Conference, the two Plans were consolidated into one NPIP.



National Poultry Improvement Plan

1976 – U.S. Salmonella Monitored was changed to U.S. Sanitation Monitored egg- and meat-type chickens.

- Turkey industry removed all programs that involved Salmonella control or monitoring.