



Food Safety and Inspection Service
U.S. DEPARTMENT OF AGRICULTURE



Scientific Support for FSIS to use a Surface Sampling Method for Beef Trim

Office of Public Health Science

FSIS to use a Surface Sampling Method for Beef Trim

- FSIS is committed to identifying and evaluating improved sample collection methods supported by science
- FSIS evaluated a surface sampling method using the MicroTally® Cloth (Cloth) as an alternative to the N60 excision method for sampling beef trim
- FSIS determined the Cloth method to be equivalent to the N60 method
- Advantages include:
 - No loss of product
 - Less time to collect samples, more time for other inspection activities
 - Safer method for inspectors, no hooks or knives required
- Additional details available in:
 - Docket No. FSIS-2022-0019: Use of a Non-Destructive Surface Sampling Device to Sample Domestic Beef Manufacturing Trimmings and Bench Trim

Scientific Support – USDA Agriculture Research Service (ARS)

- Wheeler and Arthur, JFP, 2018. [81:1605-1613](#)
 - No difference in the detection of inoculated green fluorescent protein (GFP) generic *E. coli*
 - Variable recovery of indicator organisms: Aerobic Plate Counts (APC)
 - No difference in coliform counts and generic *E. coli*
- Arthur and Wheeler, JFP, 2021. [84:536:544](#)
 - No difference in the detection of virulence genes indicative of STEC
 - Hemolysin (*hlyA*), intimin (*eae*), Non-adulterant O serogroups, H7 *fliC*, Heme receptor & Adhesion siderophore, and Antimicrobial resistance (*tetA*, *tetB*)
 - No difference in *E. coli* O157:H7 detection by cloth or N60 Plus
 - N60 Plus is similar to the N60 excision sampling method, but it uses a stainless-steel sampling device on a drill to collect surface tissue.

Scientific Support – FSIS In-Lab Study 1

- The FSIS Laboratories inoculated raw beef slices with STEC (O157:H7, O103, O121) and *Salmonella* at low levels (3.5 – 7.5 cfu/2 lb test bin)
 - Used dry cloth to sample and simulated shipment
- Cloth recovers pathogens inoculated at very low levels
 - No difference in O157 or O103 recovery
 - Less O121 recovered by the cloth
 - No difference in *Salmonella* recovery

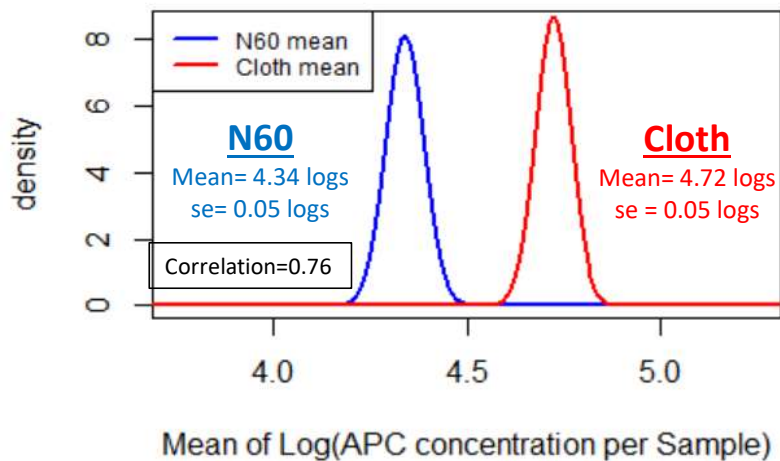
Scientific Support – FSIS In-Lab Study 2

- The FSIS Laboratories inoculated trim with *E. coli* O157:H7 (5-10 cfu/cloth) and *Salmonella* ($\sim 5 \times 10^4$ cfu/cloth)
- Tested three treatments
 - With 25mL neutralizing buffered peptone water (nBPW)
 - With 25mL buffered peptone water (BPW)
 - Dry cloth
- Adding nBPW significantly increased aerobic plate count (APC) recovery in cloth after simulated shipping
 - 0.16 log more than dry cloth; CI_{95} : (0.09, 0.23)
- nBPW did not inhibit screening, survival or recovery of *E. coli* O157 compared to dry cloth

FSIS In-field study

Cloth+nBPW recovers significantly more APC (0.38 log) than N60

Average APC recovery



Key Takeaways & Limitations

- Difference is statistically significant but may be of limited biological importance.
- Cloth+nBPW recovers more bacteria than N60.
- Oct 1, 2021 - Mar 18, 2022 (*Discontinued APC analysis*)

Williams, MS; Ebel, ED. 2014. Estimating the correlation between concentrations of two species of bacteria with censored microbial testing data. *International Journal of Food Microbiology* 175:1-5.

FSIS in-field study: Cloth+nBPW

Cloth+nBPW and N60 detect different *Salmonella* positives, but difference in percent positive is not statistically significant.

	POS N60	NEG N60
POS Cloth	26	19
NEG Cloth	26	2,507

N60 finds $52/2578 = 2.0\%$

Cloth finds $45/2578 = 1.7\%$

No significant difference in *Salmonella* percent positive by cloth or N60 (McNemar's Chi-square statistic $p=0.37$).

Observed mean difference is -0.3 percent (CI₉₅: -0.8% to 0.2%), but confidence interval crosses zero, indicating perceived difference may be due to random chance.

*Samples collected October 1, 2021 – June 30, 2022, $n=2,578$ paired samples.

FSIS Non-Compliance Reports Analysis

Non-compliance Reports (NR) Analysis

Compare three periods:

- *Before Cloth:* April 2015 - April 2017
- *Transition:* May 2017 - March 2020*
 - May 2017 FSIS issued 1st no objection letter (NOL) for use of cloth generally;
 - March 2020 FSIS issued a 2nd NOL for the in-plant validation procedures;
- *After Cloth:* April 2020 – Dec 2021

Parameters:

- Large establishments (HACCP Size)*
- With Raw non-intact and Raw intact HACCP plans
- Had at least one positive MT60 beef manufacturing trimmings or MT65 bench trim sampling result;
- NRs citing: 9 CFR 301.2 and 417.4(a)
 - Exclude NRs due to Agriculture Marketing Service (AMS) testing

*Limited analysis to large establishments

Industry adopting cloth sampling *did not* increase NRs due to missed STEC positive lots.



	Time Period	NRs	NRs per month*	NRs due to Non-O157+
Before Cloth	April 2015 - April 2017 (25 months)	8	0.32	87.5% (7/8)
Transition	May 2017 - March 2020 (35 months)	11	0.31	45.5% (5/11)
After Cloth	April 2020 – December 2021 (21 months)	4**	0.19	75% (3/4)

Most NRs are due to establishment’s failure to test for & detect non-O157 adulterant STEC (not due to sampling method).

*NRs per month = total NR in time period / number of months;

** “After Cloth” excludes 15 NRs at one establishment due to AMS National School Lunch Program detected adulterant STEC.



askfsis@usda.gov