P2-16: Evaluation of the 3M™ Petrifilm™ *Salmonella* Express System for the Detection of *Salmonella* and Strain Testing Results

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ABSTRACT

INTRODUCTION

The 3M™ Petrifilm™ *Salmonella* Express System is intended for the rapid qualitative detection and biochemical confirmation of *Salmonella* in food and food process environmental samples. The system includes an enrichment medium with a 3M™ Petrifilm™ *Salmonella* Express Plate and 3M™ Petrifilm™ *Salmonella* Express Confirmation Disk.

PURPOSE

The purpose of the internal studies was to evaluate the new system as compared to the FDA/BAM or USDA/FSIS-MLG methods for pet foods, raw ground meats, raw vegetables, processed meats, chicken rinses and environmental samples with a diverse population of known *Salmonella* serotypes and non-*Salmonella* microorganisms.

METHODS

Approximately 40 samples for each matrix group were evaluated with a strain of *Salmonella* at <5 CFU/25g or uninoculated with the new system and reference methods for recovery. In addition, raw ground beef and chicken were evaluated with 20 fractionally spiked replicates and five control replicates per food. Testing was also done with 105 *Salmonella* serotypes and 32 non-*Salmonella* strains. For the new system, samples and strains were enriched in 3M™ *Salmonella* Enrichment Base containing 3M™ *Salmonella* Enrichment Base Supplement at 41.5°C. For low microbial load foods, enrichments were sampled at 18 hours. For high microbial load foods and strains, 0.1mL samples of the primary cultures were transferred into 10mL of Rappaport-Vassilidias R10 (R-V R10) broth and incubated at 41.5°C for eight hours. All enrichments were streaked onto the new plating medium and incubated at 41.5°C for 22 hours. Plates were subsequently tested with the 3M™ Petrifilm™ *Salmonella* Express Confirmation Disk for four hours at 41.5°C.

RESULTS

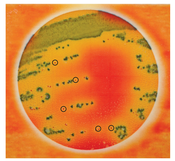
No significant differences were observed between the new system and the reference methods as indicated by Mantel-Haenszel chi-square analysis when testing fractionally spiked raw ground meat samples.

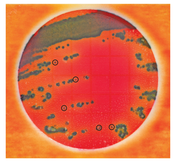
No significant differences were observed between the new system and the reference method as indicated by a students' T-test when testing raw ground meats, fresh produce, frozen processed foods, carcass rinses and environmental samples. Differences (P-value < 0.05) between the new system and the reference method were observed when testing fish and pet food samples. The new system recovered a greater number of biochemically **confirmed** positive samples than the reference method.

The new system showed sensitivity and specificity of >99% among the pure culture strains.

SIGNIFICANCE

For all matrices evaluated, the 3M Petrifilm *Salmonella* Express System gave equivalent results to the reference methods for the rapid qualitative detection and biochemical confirmation of *Salmonella* within the procedure's recommended time frame.





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Salmonella: STUDIES AND RESULTS

INCLUSIVES

Low Background Foods Method: 105 *Salmonella* isolates were tested. The *Salmonella* strains were cultured at 41.5°C for 18 hours in 3M *Salmonella* Enrichment Base containing 3M *Salmonella* Enrichment Base Supplement.

High Background Foods Method: 105 *Salmonella* isolates were tested. The *Salmonella* strains were cultured at 41.5°C for 18 hours in 3M *Salmonella* Enrichment Base containing 3M *Salmonella* Enrichment Base Supplement. A 0.1mL aliquot of the primary culture was transferred to 10mL R-V R10 broth and incubated at 41.5°C for eight hours.

EXCLUSIVES

32 non-*Salmonella* isolates were tested. The non-*Salmonella* strains were cultured at 32°C for 18 hours in Brain Heart Infusion Broth.

All samples were streaked on the 3M Petrifilm *Salmonella* Express Plate and incubated at 41.5°C for 22 hours. Plates were subsequently tested for four hours with the 3M Petrifilm *Salmonella* Express Confirmation Disk at 41.5°C.

Table 1: Sensitivity and Specificity of the 3M™ *Salmonella* Express System

Foods	Performance	Cultures	Result
Low Background Foods Method High Background Foods Method	Inclusivity	105 strains including the following *Salmonella* subspecies: *enterica, salamae, houtenae* and *indica*	99.05%
Low Background Foods Method High Background Foods Method	Exclusivity	32 strains including: *Citrobacter, Enterobacter, E. coli* and *Proteus*	100%

Salmonella: FOOD STUDIES (LOW LEVEL SPIKE)

Studies were conducted to assess the performance of the new method in the presence of possible interference from sample matrices and other background organisms. Samples were artificially contaminated with 2–5 CFU *Salmonella* Typhimurium ATCC 14028 per 25g of sample.

Fourteen sample categories which included 62 individual food samples were evaluated as follows: either the Low Background Foods Method or the High Background Foods Method. All enrichments were performed at a 1:10 dilution in 3M *Salmonella* Enrichment Base containing 3M *Salmonella* Enrichment Base Supplement for 18 hours at 41.5°C. For the High Background Foods Method, 0.1mL aliquot of the primary enrichment was transferred to 10mL R-V R10 broth and incubated for eight hours at 41.5°C. All artificially contaminated samples were tested using both the 3M Petrifilm *Salmonella* Express System Method and the appropriate Reference Method, FDA/BAM or USDA/FSIS-MLG.

Raw Ground Meat	Meat and Seafood	Fresh Produce	Frozen Processed	Pet Food	Carcass Rinse
– Chicken (95% Lean) – Chicken – Beef (86% Lean) – Beef (80% Lean) – Beef – Turkey	– Tuna – Perch – Smelt – Salmon – Shrimp (Raw/Frozen) – Sausage (Raw)	– Green Leaf Lettuce – Spinach – Alfalfa Sprouts	– Chicken Pot Pie – Chicken Nuggets – Chicken Breast Fillets – Chicken Kiev	– Dog Food (Dry) – Cat Food (Dry) – Calf Milk Replacer	– Chicken Carcass Rinse

Table 2: Performance of the 3M™ *Salmonella* Express System as compared to the reference method using a students' T-test comparison

	Raw Ground Meat	Meat and Seafood	Fresh Produce	Frozen Processed	Pet Food	Carcass Rinse	Environmental
P-value	0.7900	0.0030 (Shrimp/Fish) 1.0000 (Sausage)	1.0000	1.0000	<0.0001	0.7900	1.0000

Differences (P-value < 0.05) between the new system and the reference method were observed with pet food and fish samples. The new system recovered a greater number of biochemically **confirmed** positive samples than the reference method.

Salmonella: FOOD STUDIES (FRACTIONAL SPIKE)

Studies were conducted to assess the performance of the method in raw ground beef and raw ground chicken. Samples were either: artificially contaminated at a fractional level of 0–2 CFU *Salmonella* Typhimurium ATCC 14028 or non-contaminated matrix controls.

All enrichments were performed at a 1:10 dilution in 3M *Salmonella* Enrichment Base containing 3M *Salmonella* Enrichment Base Supplement for 18 hours at 41.5°C. A 0.1mL aliquot of the primary enrichment was transferred to 10mL R-V R10 broth and incubated for eight hours at 41.5°C. All artificially contaminated samples were tested using both the 3M Petrifilm *Salmonella* Express System Method and the appropriate Reference Method, FDA/BAM or USDA/FSIS-MLG.

Table 3: Performance of the 3M™ *Salmonella* Express System as compared to the reference method using a Mantel-Haenzel Chi-Square comparison

Supplement	Comparison	Food	Chi Square	P-value
Lot 1	Reference	Ground Beef	0.90	0.34
		Ground Chicken	0.87	0.35
Lot 2	Reference	Ground Beef	1.63	0.20
		Ground Chicken	0.12	0.73
Lot 3	Reference	Ground Beef	0.39	0.53
		Ground Chicken	0.00	1.00

CONCLUSIONS

No significant differences were observed between the new system and the reference methods as indicated by Mantel-Haenszel chi-square analysis when testing fractionally spiked raw ground meat samples.

No significant differences were observed between the new system and the reference method as indicated by a students' T-test when testing raw ground meats, fresh produce, frozen processed foods, carcass rinses and environmental samples. Differences (P-value < 0.05) between the new system and the reference method were observed when testing fish and pet food samples. The new system recovered a greater number of biochemically **confirmed** positive samples than the reference method.

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