



# CERTIFICATION

**AOAC<sup>®</sup> Performance Tested<sup>SM</sup>**

Certificate No.

**051801**

The AOAC Research Institute hereby certifies that the performance of the test kit known as:

**3M<sup>TM</sup> Petrifilm<sup>TM</sup> E. coli/Coliform Count Plate**

manufactured by  
**3M Company**  
**Food Safety Department**  
**3M Center, Bldg. 275-5W-05**  
**St. Paul, MN 55144**  
**USA**

This method has been evaluated in the AOAC<sup>®</sup> Performance Tested Methods<sup>SM</sup> Program, and found to perform as stated by the manufacturer contingent to the comments contained in the manuscript. This certificate means that an AOAC<sup>®</sup> Certification Mark License Agreement has been executed which authorizes the manufacturer to display the AOAC Performance Tested<sup>SM</sup> certification mark along with the statement - "THIS METHOD'S PERFORMANCE WAS REVIEWED BY AOAC RESEARCH INSTITUTE AND WAS FOUND TO PERFORM TO THE MANUFACTURER'S SPECIFICATIONS" - on the above mentioned method for a period of one calendar year from the date of this certificate (December 21, 2018 – December 31, 2019). Renewal may be granted at the end of one year under the rules stated in the licensing agreement.

*Scott Coates*

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Scott Coates, Senior Director  
Signature for AOAC Research Institute

December 21, 2018

\_\_\_\_\_  
Date

**METHOD AUTHORS**

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**SUBMITTING COMPANY**

3M Company  
Food Safety Department  
3M Center, Bldg. 260-6B-01  
St. Paul, MN 55144  
USA

**KIT NAME(S)**

3M™ Petrifilm™ *E. coli*/Coliforms Count Plate

**CATALOG NUMBERS**

6436, 6437

**INDEPENDENT LABORATORY**

Q Laboratories, Inc.  
1400 Harrison Ave  
Cincinnati, OH 45214  
USA

**AOAC EXPERTS AND PEER REVIEWERS**

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**APPLICABILITY OF METHOD**

Target organism – *Escherichia coli* and coliforms

**Matrices**

FDA BAM Ch. 4 (11 g) (Evaluated with BPBD): Pasteurized whole milk, butter, non-fat dry milk powder.

FDA BAM Ch.4 (50 g) (Evaluated with BPBD): fresh raw ground pork (90% lean), lamb chop, fresh raw ground chicken (92% lean), chicken carcass rinsate, shell eggs, liquid egg whites, powdered egg whites, sprouts, cranberries, powdered infant formula with probiotics, powdered infant formula without probiotics, dry dog kibble, flour (all-purpose), chocolate chip cookie dough, fresh raw ground beef (73% lean), raw frozen chicken wings (bone in, skin on), raw milk, whole liquid egg, tuna sushi (tuna fillet, no rice), smoked salmon, bunched spinach, pasteurized carrot juice, ready-made sandwiches (turkey breast, provolone cheese, lettuce, red onion and multi-grain bread), raw vegetable with salad dressing (coleslaw), chicken feed, soybean meal, stainless steel (type 304, food grade, 4 x 4 in sponge), sealed concrete (4 x 4 in sponge).

ISO 4832:2006 (10 g); ISO 16649-2:2001 (10) (Evaluated with PSS): fresh raw ground beef (73% lean), raw frozen chicken wings (bone in, skin on), raw milk, whole liquid egg, tuna sushi (tuna fillet, no rice), smoked salmon, bunched spinach, pasteurized carrot juice, ready-made sandwiches (turkey breast, provolone cheese, lettuce, red onion and multi-grain bread), raw vegetable with salad dressing (coleslaw), chicken feed, soybean meal, stainless steel (type 304, food grade, 4 x 4 in sponge), sealed concrete (4 x 4 in sponge).

Performance claims - The 3M Petrifilm Rapid *E. coli*/Coliform Count Plate is considered equivalent to the reference methods for a broad range of foods and select environmental surfaces.

**REFERENCE METHODS**

U.S. FDA *Bacteriological Analytical Manual* Chapter 4 (2017) Enumeration of *Escherichia coli* and the Coliform Bacteria,  
<https://www.fda.gov/Food/FoodScienceResearch/LaboratoryMethods/ucm064948.htm>  
(accessed November 2017) (2)  
(ISO 4832:2006 *Microbiology of food and animal feeding stuffs -- Horizontal methods for the enumeration of coliforms – Colony- count technique* (3)  
ISO 16649-2:2001 *Microbiology of food and animal feeding stuffs -- Horizontal methods for the enumeration of beta-glucuronidase-positive Escherichia coli -- Part 2: Colony-count technique at 44 degrees C using 5-bromo-4-chloro-3-indolyl beta-D-glucuronide*(4)

**ORIGINAL CERTIFICATION DATE**

May 04, 2018

**CERTIFICATION RENEWAL RECORD**

Renewed annually through December 2019

**METHOD MODIFICATION RECORD**

NONE

**SUMMARY OF MODIFICATION**

NONE

Under this AOAC® *Performance Tested*<sup>SM</sup> License Number, 051801 this method is distributed by:

NONE

Under this AOAC® *Performance Tested*<sup>SM</sup> License Number, 051801 this method is distributed as:

NONE

## PRINCIPLE OF THE METHOD (2)

The 3M Petrifilm Rapid *E. coli*/Coliform Count Plate is a self-contained, sample-ready-culture-medium system which contains a cold-water-soluble gelling agent and two different indicators; 5-bromo-4-chloro-3-indolyl-D-glucuronide that indicates glucuronidase activity and tetrazolium that facilitates colony enumeration. The 3M Petrifilm Rapid *E. coli*/Coliform Count Plate is intended for the use for the enumeration of both *E. coli* and coliforms in various food and beverage products and from environmental surfaces. The typical colony morphology for *E. coli* is blue to blue-green colonies with or without gas production, regardless of size or color intensity. Other coliform isolates will appear as red colonies with entrapped gas (within approximately one colony diameter). The accurate quantitative range is less than or equal to 100 CFU per plate for the total coliform count, and less than or equal to 100 blue to blue-green CFU per plate for the *E. coli* count.

## DISCUSSION OF THE VALIDATION STUDY (2)

The studies conducted in this evaluation show that the results from the 3M Petrifilm Rapid *E. coli*/Coliform Count Plate were not statistically different when compared to the BAM Ch. 4, ISO 4832:2006 and ISO 16649-2:2001 for the enumeration of *E. coli* and total coliforms.

In inclusivity and exclusivity studies, the 3M Petrifilm Rapid *E. coli*/Coliform Count Plate identified all strains tested in accordance with BAM Ch. 4, ISO 4832:2006 and ISO 16649-2:2001. One strain of *E. coli*, 3M REC12, a strain recognized as an atypical isolate, produced a typical coliform reaction on the plate (red colony with gas), and was also negative for *E. coli* with the BAM method (did not fluoresce on VRB with MUG plates) and ISO 16649-2:2001 (atypical on TBX). All other *E. coli* isolates tested were positive (blue to blue/green) on the 3M Petrifilm Rapid *E. coli*/Coliform Count Plate. All non-*E. coli* strains tested were negative (Tables 1–4). Of the 50 strains tested in the coliform inclusivity study, all non-*E. coli* isolates, except for *Pantoea agglomerans* which was excluded as a coliform from the BAM and ISO methods as well, produced red colonies. Thirteen of the isolates produced red colonies without gas; *Citrobacter amalonaticus*, *Citrobacter koseri* (two strains) *Citrobacter braakii*, *Citrobacter farmeri*, *Citrobacter freundii* (three strains), *Citrobacter youngae*, *Serratia liquefaciens* and *Serratia marcescens* (three strains). These strains did not produce gas in BLGB broth, as indicated in the BAM method, and thus by the BAM definition (gas production from lactose) are not typical coliform strains. However, ISO 4832:2006 defines coliforms by their ability to grow on specific, selective media, so gas production is not a requirement for coliform identification. Because this validation was conducted in harmonization with MicroVal, on the 3M Petrifilm Rapid *E. coli*/Coliform Count Plate, coliforms are indicated by red colonies with or without gas production and blue colonies with or without gas production. By this definition, the non-gassing *Citrobacter* and *Serratia* are considered positive as coliforms. All other non-*E. coli* coliform isolates tested were positive (red colonies with gas production), and the *E. coli* isolates tested were positive (blue to blue/green). All non-coliform strains tested were negative (Tables 5–8).

In the matrix study, 31 foods and two environmental surfaces were tested by the 3M Petrifilm Rapid *E. coli*/Coliform Count Plate in comparison to BAM Ch. 4 and 12 foods and two environmental surfaces in comparison to ISO 4832:2006 and ISO 16649-2:2001. Mean differences of log transformed results between the 3M Petrifilm Rapid *E. coli*/Coliform Count Plate and the reference methods were well below 0.5 log<sub>10</sub> for all contamination levels of all matrices tested. Differences were <0.2 log<sub>10</sub> and lower in most cases when comparing the 3M Petrifilm Rapid *E. coli*/Coliform Count Plate to BAM Ch. 4 and <0.06 log<sub>10</sub> when comparing to the ISO methods. The same contaminated materials were used for each method, so the smaller differences with the ISO methods could be due to the test portion sizes (50 g for the BAM method and 10 g for the ISO methods), the different diluents (BPBD for BAM and PSS for ISO) or more likely the different media compositions. Also, foods with larger mean differences, such as butter, non-fat dry milk powder, shell eggs, liquid egg whites, dry dog kibble and dry cat food were only tested in the BAM comparison and were not tested in the ISO comparison. For these foods, the recovery of coliforms and *E. coli* was generally higher for the 3M Petrifilm Rapid *E. coli*/Coliform Count Plate than for BAM Ch.4. From the surfaces, particularly stainless steel, the reference methods tended to show better recovery of coliforms and *E. coli*. It could be that the desiccation stress of the cells after drying down on the surfaces affected the recovery of the cells on the 3M Petrifilm Rapid *E. coli*/Coliform Count Plate more than on the reference method media.

Confidence intervals were calculated on the mean differences for each comparison, and were within the recommended (-0.5, 0.5) except for four cases in the BAM Ch. 4 comparison for coliforms (shell eggs, liquid egg whites, dry dog kibble and stainless steel), seven cases in the BAM Ch. 4 comparison for *E. coli* (shell eggs, liquid egg whites, 2 levels of Gerber Rice Cereal, dry cat food, flour and stainless steel), and one case in the ISO 16649-2:2001 for *E. coli* (stainless steel). Confident intervals tend to be wider when the  $s_r$  is relatively high for one or both methods being compared. In this study,  $s_r$  was <0.2 in most cases, and often <0.1. Where the CIs were outside the (-0.5, 0.5) range, the  $s_r$  was >0.2 for one or both methods. However, in all cases, the mean differences were still <0.5 (Tables 12–15).

Robustness testing proved that the performance of the 3M Petrifilm Rapid *E. coli*/Coliform Count Plate was not adversely affected by small variations in key parameters (sample volume and incubation time), such that may occur during routine laboratory use.

The 3M Petrifilm Rapid *E. coli*/Coliform Count Plate offers the ability to not only detect but enumerate coliform and *E. coli* colonies in as few as 18 h. It allows for easy visibility and differentiation of *E. coli* and coliform colonies on a single plate, while the FDA method requires skilled visible differentiation and the ISO methods requires two different media formulations and procedures. The small and stackable size of the 3M Petrifilm Rapid *E. coli*/Coliform Count Plate an advantage if space is a factor for specific laboratories.

Table 1. 3M Petrifilm Rapid *E. coli*/Coliform Count Plate: *E. coli* inclusivity results vs. BAM Chapter 4 (2)

No.	Organism	Source	Origin	3M Petrifilm Rapid <i>E. coli</i> /Coliform Count Plate CFU/mL			BAM Ch. 4 CFU/mL		
				32°C	35°C	42°C	32°C	35°C	42°C
1	<i>Escherichia coli</i>	ATCC <sup>a</sup> 8739	Feces	53	63	46	52	60	50
2	<i>Escherichia coli</i>	NBRC <sup>b</sup> 15034	Clinical specimen	56	54	49	55	54	54
3	<i>Escherichia coli</i>	ATCC 25922	Not available <sup>c</sup>	41	42	49	40	44	45
4	<i>Escherichia coli</i>	ATCC 11229	Feces	21	19	28	22	20	30
5	<i>Escherichia coli</i>	ATCC 10536	Not available	48	41	69	50	50	75
6	<i>Escherichia coli</i>	ATCC 11303	Not available	92	96	94	95	95	98
7	<i>Escherichia coli</i>	ATCC 11775	Food, Minnesota	97	99	95	99	95	97
8	<i>Escherichia coli</i>	QL <sup>d</sup> 11010-2	Bottled water	23	21	39	25	20	34
9	<i>Escherichia coli</i>	ATCC 14948	Not available	99	99	99	102	101	98
10	<i>Escherichia coli</i>	ATCC 23848	Not available	99	99	99	99	103	100
11	<i>Escherichia coli</i>	ATCC 33849	Not available	20	30	15	23	29	18
12	<i>Escherichia coli</i>	ATCC 35218	Canine, Tennessee	30	34	59	35	38	62
13	<i>Escherichia coli</i>	ATCC 35421	Not available	63	65	93	63	66	90
14	<i>Escherichia coli</i>	QL 41411.1	Bottled water	28	44	30	29	41	26
15	<i>Escherichia coli</i>	QL 41411.2	Bottled water	52	66	78	53	65	75
16	<i>Escherichia coli</i>	QL16154-1	Beef carcass sponge	82	61	79	79	65	74
17	<i>Escherichia coli</i>	QL 16154-2	Raw ground beef	61	57	51	59	58	52
18	<i>Escherichia coli</i>	QL 16154-3	Beef trim	71	97	97	74	95	101
19	<i>Escherichia coli</i>	QL 16154-5	Flavored seasoning	53	68	71	51	70	74
20	<i>Escherichia coli</i>	QL 16154-7	Flour	39	56	59	44	58	62
21	<i>Escherichia coli</i>	QL 16154-12	Chicken carcass rinsate	56	70	56	54	68	55
22	<i>Escherichia coli</i>	QL 16154-13	Potable water	33	55	53	33	51	52
23	<i>Escherichia coli</i>	QL 16154-15	Raw chicken breast	5	6	9	6	6	10
24	<i>Escherichia coli</i>	QL 16160-2	Mixed frozen vegetables	84	91	94	80	84	89
25	<i>Escherichia coli</i>	QL 16160-3	Frozen greens	66	88	73	68	84	72
26	<i>Escherichia coli</i>	QL 16160-4	Chicken nuggets	31	42	52	36	43	54
27	<i>Escherichia coli</i>	QL 16160-6	Flavored seasoning	41	45	48	43	46	50
28	<i>Escherichia coli</i>	QL16160-8	Chicken carcass rinsate	35	40	40	32	39	38
29	<i>Escherichia coli</i>	QL 16160-9	Fresh baby spinach	82	91	77	86	90	77
30	<i>Escherichia coli</i>	QL 16160-10	Raw pork	41	42	47	86	90	77
31	<i>Escherichia coli</i>	QL 16160-11	Raw beef trimmings	37	49	53	42	44	45
32	<i>Escherichia coli</i>	QL 16160-13	Irrigation rinsate water	10	8	13	35	48	49
33	<i>Escherichia coli</i>	Q L 16160-16	Sprouts	72	73	74	8	9	11
34	<i>Escherichia coli</i>	QL 16160-17	Fresh spinach	26	48	63	70	71	71
35	<i>Escherichia coli</i>	QL 16160-18	Frozen mixed vegetables	34	58	89	29	45	60
36	<i>Escherichia coli</i>	3M <sup>e</sup> REC1	Mozzarella cheese	36	57	73	31	57	90
37	<i>Escherichia coli</i>	3M REC5	Food isolate	52	68	73	54	67	74
38	<i>Escherichia coli</i>	3M REC7	Food isolate	55	61	53	58	62	58
39	<i>Escherichia coli</i>	3M REC8	Food isolate	19	29	17	22	26	18
40	<i>Escherichia coli</i>	3M REC9	Food isolate	25	23	19	21	20	18
41	<i>Escherichia coli</i>	3M REC10	Food isolate	38	35	26	35	34	30
42	<i>Escherichia coli</i>	3M REC11	Food isolate	17	24	21	20	25	22
43	<i>Escherichia coli</i>	3M REC12 <sup>e</sup>	Not available	31	40	62	27	37	64
44	<i>Escherichia coli</i>	3M REC13	Not available	41	40	54	38	40	55
45	<i>Escherichia coli</i>	3M REC14	Not available	51	52	58	47	50	49

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46	<i>Escherichia coli</i>	3M REC15	Not available	77	87	93	75	88	90
47	<i>Escherichia coli</i>	3M REC16	Not available	47	53	48	48	49	46
48	<i>Escherichia coli</i>	3M REC17	Not available	30	49	61	32	52	57
49	<i>Escherichia coli</i>	3M REC18	Not available	39	37	44	41	40	48
50	<i>Escherichia coli</i>	3M REC19	Not Available	21	27	38	19	23	31

<sup>a</sup>ATCC: American Type Culture Collection, Manassas, VA.

<sup>b</sup>NRBC: NITE Biological Resource Center, Tokyo, Japan.

<sup>c</sup>Origin not available.

<sup>d</sup>QL: Q Laboratories Culture Collection, Cincinnati, OH.

<sup>e</sup>3M: 3M Food Safety, St. Paul, MN.

<sup>d</sup>Atypical *E. coli* strain

**Table 2. 3M Petrifilm Rapid *E. coli*/Coliform Count Plate: *E. coli* inclusivity results vs. ISO 16649-2:2001 (2)**

No.	Organism	Source	Origin	3M Petrifilm Rapid <i>E. coli</i> /Coliform Count Plate CFU/mL			ISO 16649-2:2001 CFU/mL		
				30°C	37°C	42°C	30°C	37°C	44°C
1	<i>Escherichia coli</i>	ATCC <sup>a</sup> 8739	Feces	64	60	46	60	63	43
2	<i>Escherichia coli</i>	NBRC <sup>b</sup> 15034	Clinical specimen	38	51	49	37	49	51
3	<i>Escherichia coli</i>	ATCC 25922	Not available <sup>c</sup>	49	34	49	48	34	47
4	<i>Escherichia coli</i>	ATCC 11229	Feces	38	37	28	39	38	32
5	<i>Escherichia coli</i>	ATCC 10536	Not available	56	84	69	54	78	68
6	<i>Escherichia coli</i>	ATCC 11303	Not available	82	82	94	80	87	95
7	<i>Escherichia coli</i>	ATCC 11775	Food, Minnesota	89	91	95	84	92	94
8	<i>Escherichia coli</i>	QL <sup>d</sup> 11010-2	Bottled water	49	42	39	53	41	40
9	<i>Escherichia coli</i>	ATCC 14948	Not available	92	98	99	90	95	99
10	<i>Escherichia coli</i>	ATCC 23848	Not available	99	97	99	99	99	98
11	<i>Escherichia coli</i>	ATCC 33849	Not available	7	25	15	10	28	16
12	<i>Escherichia coli</i>	ATCC 35218	Canine, Tennessee	60	55	59	62	57	60
13	<i>Escherichia coli</i>	ATCC 35421	Not available	93	90	93	93	94	91
14	<i>Escherichia coli</i>	QL 41411.1	Bottled water	79	63	30	77	61	31
15	<i>Escherichia coli</i>	QL 41411.2	Bottled water	66	73	78	64	75	75
16	<i>Escherichia coli</i>	QL16154-1	Beef carcass sponge	73	82	79	72	79	80
17	<i>Escherichia coli</i>	QL 16154-2	Raw ground beef	56	69	51	58	73	49
18	<i>Escherichia coli</i>	QL 16154-3	Beef trim	96	91	97	97	97	96
19	<i>Escherichia coli</i>	QL 16154-5	Flavored seasoning	43	68	71	48	61	69
20	<i>Escherichia coli</i>	QL 16154-7	Flour	62	64	59	60	65	62
21	<i>Escherichia coli</i>	QL 16154-12	Chicken carcass rinsate	57	40	56	52	38	58
22	<i>Escherichia coli</i>	QL 16154-13	Potable water	47	75	53	49	73	52
23	<i>Escherichia coli</i>	QL 16154-15	Raw chicken breast	31	21	9	30	24	11
24	<i>Escherichia coli</i>	QL 16160-2	Mixed frozen vegetables	89	98	94	90	95	93
25	<i>Escherichia coli</i>	QL 16160-3	Frozen greens	89	87	73	87	91	71
26	<i>Escherichia coli</i>	QL 16160-4	Chicken nuggets	31	45	52	30	43	50
27	<i>Escherichia coli</i>	QL 16160-6	Flavored seasoning	40	78	48	44	78	49
28	<i>Escherichia coli</i>	QL16160-8	Chicken carcass rinsate	31	79	40	29	75	40
29	<i>Escherichia coli</i>	QL 16160-9	Fresh baby spinach	55	96	77	51	92	73
30	<i>Escherichia coli</i>	QL 16160-10	Raw pork	33	67	47	32	68	48
31	<i>Escherichia coli</i>	QL 16160-11	Raw beef trimmings	46	35	53	45	32	52
32	<i>Escherichia coli</i>	QL 16160-13	Irrigation rinsate water	69	12	13	70	10	16
33	<i>Escherichia coli</i>	Q L 16160-16	Sprouts	57	67	74	59	69	72
34	<i>Escherichia coli</i>	QL 16160-17	Fresh spinach	49	70	63	48	72	62

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35	<i>Escherichia coli</i>	QL 16160-18	Frozen mixed vegetables	14	65	89	18	61	90
36	<i>Escherichia coli</i>	3M <sup>e</sup> REC1	Mozzarella cheese	43	88	73	45	88	55
37	<i>Escherichia coli</i>	3M REC5	Food isolate	81	54	73	84	58	72
38	<i>Escherichia coli</i>	3M REC7	Food isolate	28	50	53	30	51	54
39	<i>Escherichia coli</i>	3M REC8	Food isolate	72	37	17	71	30	19
40	<i>Escherichia coli</i>	3M REC9	Food isolate	31	26	19	31	27	21
41	<i>Escherichia coli</i>	3M REC10	Food isolate	74	50	26	75	48	23
42	<i>Escherichia coli</i>	3M REC11	Food isolate	21	31	21	20	33	19
43	<i>Escherichia coli</i>	3M REC12 <sup>f</sup>	Not available	42	74	62	40	70	59
44	<i>Escherichia coli</i>	3M REC13	Not available	48	60	54	50	58	51
45	<i>Escherichia coli</i>	3M REC14	Not available	37	64	58	40	69	62
46	<i>Escherichia coli</i>	3M REC15	Not available	72	91	93	75	94	95
47	<i>Escherichia coli</i>	3M REC16	Not available	67	67	48	68	68	47
48	<i>Escherichia coli</i>	3M REC17	Not available	51	41	61	55	41	63
49	<i>Escherichia coli</i>	3M REC18	Not available	62	76	44	64	75	45
50	<i>Escherichia coli</i>	3M REC19	Not Available	41	28	38	44	29	41

<sup>a</sup>ATCC: American Type Culture Collection, Manassas, VA.

<sup>b</sup>NRBC: NITE Biological Resource Center, Tokyo, Japan.

<sup>c</sup>Origin not available.

<sup>d</sup>QL: Q Laboratories Culture Collection, Cincinnati, OH.

<sup>e</sup>3M: 3M Food Safety, St. Paul, MN.

<sup>f</sup>Atypical *E. coli* strain

Table 3. 3M Petrifilm Rapid *E. coli*/Coliform Count Plate: *E. coli* exclusivity results vs. BAM Chapter 4 (1)

No.	Organism	Source	Origin	3M Petrifilm Rapid <i>E. coli</i> /Coliform Count Plate CFU/mL			BAM Ch. 4 CFU/mL		
				32°C	35°C	42°C	32°C	35°C	42°C
1	<i>Acinetobacter baumannii</i>	ATCC <sup>a</sup> 19606	Urine	<1	<1	<1	<1	<1	<1
2	<i>Aeromonas viridans</i>	QL <sup>b</sup> 17041-8	Raw milk isolate	<1	<1	<1	<1	<1	<1
3	<i>Alcaligenes faecalis</i>	ATCC 8750	Not available <sup>c</sup>	<1	<1	<1	<1	<1	<1
4	<i>Bordetella bronchiseptica</i>	ATCC 10580	Lung of dog	<1	<1	<1	<1	<1	<1
5	<i>Brochothrix thermosphacta</i>	ATCC 11509	Animal-derived foodstuff	<1	<1	<1	<1	<1	<1
6	<i>Carnobacterium maltaromaticum</i>	ATCC 43224	Vacuum packed beef	<1	<1	<1	<1	<1	<1
7	<i>Citrobacter freundii</i>	QL 100813-2A	Deli meat	<1	<1	<1	<1	<1	<1
8	<i>Citrobacter freundii</i>	ATCC 51613	Clinical isolate	<1	<1	<1	<1	<1	<1
9	<i>Cronobacter condimenti</i>	QL 17031.1	Infant formula	<1	<1	<1	<1	<1	<1
10	<i>Cronobacter sakazakii</i>	QL 11007-9	Rice flour	<1	<1	<1	<1	<1	<1
11	<i>Enterococcus faecium</i>	ATCC 516	Clinical isolate	<1	<1	<1	<1	<1	<1
12	<i>Haemophilus influenzae</i>	ATCC 19418	Not available	<1	<1	<1	<1	<1	<1
13	<i>Hafnia alvei</i>	ATCC 51815	Milk	<1	<1	<1	<1	<1	<1
14	<i>Kurthia gibsonii</i>	ATCC 43195	RTE meat	<1	<1	<1	<1	<1	<1
15	<i>Klebsiella oxytoca</i>	ATCC 43165	Clinical	<1	<1	<1	<1	<1	<1
16	<i>Klebsiella pneumoniae</i>	QL 1100-7	Raw meat	<1	<1	<1	<1	<1	<1
17	<i>Kluyvera intermedia</i>	ATCC 33110	Surface water	<1	<1	<1	<1	<1	<1
18	<i>Microbacterium testaceum</i>	ATCC 15829	Paddy	<1	<1	<1	<1	<1	<1
19	<i>Morganella morganii</i>	ATCC 25829	Human isolate	<1	<1	<1	<1	<1	<1
20	<i>Pantoea agglomerans</i>	ATCC 19552	sewage	<1	<1	<1	<1	<1	<1
21	<i>Proteus mirabilis</i>	QL 11007-6	Animal specimen	<1	<1	<1	<1	<1	<1
22	<i>Providencia stuartii</i>	QL 11007-5	Clinical isolate	<1	<1	<1	<1	<1	<1
23	<i>Pseudomonas extremorientalis</i>	QL 17041-1	Raw milk Isolate	<1	<1	<1	<1	<1	<1
24	<i>Pseudomonas fluorescens</i>	QL 17041-3	Raw milk Isolate	<1	<1	<1	<1	<1	<1
25	<i>Rahnella aquatilis</i>	QL 14181-2A	Soy protein	<1	<1	<1	<1	<1	<1
26	<i>Salmonella Typhimurium</i>	QL 011414-2	Raw material	<1	<1	<1	<1	<1	<1
27	<i>Serratia marcescens</i>	QL 11007-1	Bottled water	<1	<1	<1	<1	<1	<1
28	<i>Streptococcus pyogenes</i>	ATCC 19615	Pharynx of child following sore throat.	<1	<1	<1	<1	<1	<1
29	<i>Sphingomonas paucimobilis</i>	ATCC 29837	Hospital respirator	<1	<1	<1	<1	<1	<1
30	<i>Vibrio vulnificus</i>	QL 021111A	Seafood product	<1	<1	<1	<1	<1	<1

<sup>a</sup>ATCC: American Type Culture Collection, Manassas, VA.<sup>b</sup>QL: Q Laboratories Culture Collection, Cincinnati, OH.<sup>c</sup>Origin not available

Table 4. 3M Petrifilm Rapid *E. coli*/Coliform Count Plate: *E. coli* exclusivity results vs. ISO 16649-2:2001 (2)

No.	Organism	Source	Origin	3M Petrifilm Rapid <i>E. coli</i> /Coliform Count Plate CFU/mL			ISO 16649-2:2001 CFU/mL		
				30°C	37°C	42°C	30°C	37°C	44°C
1	<i>Acinetobacter baumannii</i>	ATCC <sup>a</sup> 19606	Urine	<1	<1	<1	<1	<1	<1
2	<i>Aeromonas viridans</i>	QL <sup>b</sup> 17041-8	Raw milk isolate	<1	<1	<1	<1	<1	<1
3	<i>Alcaligenes faecalis</i>	ATCC 8750	Not available <sup>c</sup>	<1	<1	<1	<1	<1	<1
4	<i>Bordetella bronchiseptica</i>	ATCC 10580	Lung of dog	<1	<1	<1	<1	<1	<1
5	<i>Brochothrix thermosphacta</i>	ATCC 11509	Animal-derived foodstuff	<1	<1	<1	<1	<1	<1
6	<i>Carnobacterium Maltaromaticum</i>	ATCC 43224	Vacuum packed beef	<1	<1	<1	<1	<1	<1
7	<i>Citrobacter freundii</i>	QL 100813-2A	Deli meat	<1	<1	<1	<1	<1	<1
8	<i>Citrobacter freundii</i>	ATCC 51613	Clinical isolate	<1	<1	<1	<1	<1	<1
9	<i>Cronobacter condimenti</i>	QL 17031.1	Infant formula	<1	<1	<1	<1	<1	<1
10	<i>Cronobacter sakazakii</i>	QL 11007-9	Rice flour	<1	<1	<1	<1	<1	<1
11	<i>Enterococcus faecium</i>	ATCC 516	Clinical isolate	<1	<1	<1	<1	<1	<1
12	<i>Haemophilus influenzae</i>	ATCC 19418	Not available	<1	<1	<1	<1	<1	<1
13	<i>Hafnia alvei</i>	ATCC 51815	Milk	<1	<1	<1	<1	<1	<1
14	<i>Kurthia gibsonii</i>	ATCC 43195	RTE meat	<1	<1	<1	<1	<1	<1
15	<i>Klebsiella oxytoca</i>	ATCC 43165	Clinical	<1	<1	<1	<1	<1	<1
16	<i>Klebsiella pneumoniae</i>	QL 1100-7	Raw meat	<1	<1	<1	<1	<1	<1
17	<i>Kluyvera intermedia</i>	ATCC 33110	Surface water	<1	<1	<1	<1	<1	<1
18	<i>Microbacterium testaceum</i>	ATCC 15829	Paddy	<1	<1	<1	<1	<1	<1
19	<i>Morganella morganii</i>	ATCC 25829	Human isolate	<1	<1	<1	<1	<1	<1
20	<i>Pantoea agglomerans</i>	ATCC 19552	sewage	<1	<1	<1	<1	<1	<1
21	<i>Proteus mirabilis</i>	QL 11007-6	Animal specimen	<1	<1	<1	<1	<1	<1
22	<i>Providencia stuartii</i>	QL 11007-5	Clinical isolate	<1	<1	<1	<1	<1	<1
23	<i>Pseudomonas extremorientalis</i>	QL 17041-1	Raw milk Isolate	<1	<1	<1	<1	<1	<1
24	<i>Pseudomonas fluorescens</i>	QL 17041-3	Raw milk Isolate	<1	<1	<1	<1	<1	<1
25	<i>Rahnella aquatilis</i>	QL 14181-2A	Soy protein	<1	<1	<1	<1	<1	<1
26	<i>Salmonella Typhimurium</i>	QL 011414-2	Raw material	<1	<1	<1	<1	<1	<1
27	<i>Serratia marcescens</i>	QL 11007-1	Bottled water	<1	<1	<1	<1	<1	<1
28	<i>Streptococcus pyogenes</i>	ATCC 19615	Pharynx of child following sore throat.	<1	<1	<1	<1	<1	<1
29	<i>Sphingomonas paucimobilis</i>	ATCC 29837	Hospital respirator	<1	<1	<1	<1	<1	<1
30	<i>Vibrio vulnificus</i>	QL 021111A	Seafood product	<1	<1	<1	<1	<1	<1

<sup>a</sup>ATCC: American Type Culture Collection, Manassas, VA.<sup>b</sup>QL: Q Laboratories Culture Collection, Cincinnati, OH.<sup>c</sup>Origin not available



Table 5. 3M Petrifilm Rapid *E. coli*/Coliform Count Plate: Coliform inclusivity results vs. BAM Chapter 4 (2)

No.	Organism	Source	Origin	3M Petrifilm Rapid <i>E. coli</i> /Coliform Count Plate CFU/mL			BAM Ch. 4 CFU/mL		
				32°C	35°C	42°C	32°C	35°C	42°C
1	<i>Citrobacter amalonaticus</i> <sup>a</sup>	ATCC <sup>b</sup> 25405	Feces	65	79	88	61	70	81
2	<i>Citrobacter koseri</i> <sup>a</sup>	ATCC 27156	Not available <sup>c</sup>	36	40	36	44	45	43
3	<i>Citrobacter koseri</i> <sup>a</sup>	ATCC BAA-895	Clinical specimen - infant	97	74	96	92	80	87
4	<i>Citrobacter braakii</i> <sup>a</sup>	ATCC 43162	Clinical isolate, California	73	89	98	75	91	98
5	<i>Citrobacter farmeri</i> <sup>a</sup>	ATCC 51633	human feces, North Carolina	81	72	79	82	74	78
6	<i>Citrobacter freundii</i> <sup>a</sup>	QL <sup>d</sup> 100813-2A	Sliced deli meat (turkey)	99	99	98	97	102	98
7	<i>Citrobacter freundii</i> <sup>a</sup>	QL 11007-10	Clinical hospital	29	61	86	34	58	78
8	<i>Citrobacter freundii</i> <sup>a</sup>	ATCC 43864	Not available	20	54	23	24	57	20
9	<i>Citrobacter youngae</i> <sup>a</sup>	ATCC 11102	Not available	62	59	59	62	60	66
10	<i>Enterobacter aerogenes</i>	QL100813-1A	Raw vegetable	97	99	98	95	98	94
11	<i>Enterobacter aerogenes</i>	ATCC 13048	Sputum	71	84	80	68	50	84
12	<i>Enterobacter aerogenes</i>	ATCC 35029	Not available	61	86	83	68	81	78
13	<i>Enterobacter amnigenus</i>	ATCC 51816	Milk, Minnesota	19	15	1	17	12	3
14	<i>Enterobacter cancerogenus</i>	QL 11010-2	Bottled water	19	59	59	35	31	35
15	<i>Enterobacter cancerogenus</i>	QL 11010-1	Bottled water	34	26	39	25	61	60
16	<i>Enterobacter cloacae</i>	QL 100813-3A	Soy protein	99	99	99	99	98	103
17	<i>Enterobacter cloacae</i>	ATCC 13047	Spinal fluid	72	87	98	74	83	88
18	<i>Enterobacter cloacae</i>	NBRC <sup>e</sup> 13535	Spinal fluid	92	97	98	95	96	95
19	<i>Enterobacter cloacae</i>	NBRC 13536	Not Available	36	41	87	40	47	88
20	<i>Enterobacter gergoviae</i>	ATCC 33028	Urine, France	65	73	30	60	69	28
21	<i>Hafnia alvei</i>	ATCC 51815	Milk	64	70	8	66	69	10
22	<i>Klebsiella oxytoca</i>	ATCC 51817	Milk	29	23	41	30	27	38
23	<i>Klebsiella oxytoca</i>	ATCC 11686	Not available	99	99	99	102	100	103
24	<i>Klebsiella oxytoca</i>	NCTC <sup>f</sup> 49334	Not available	13	26	19	15	26	18
25	<i>Klebsiella oxytoca</i>	ATCC 700324	Not available	48	48	55	49	48	50
26	<i>Klebsiella pneumoniae</i>	ATCC 11296	Not available	29	51	16	30	47	19
27	<i>Klebsiella pneumoniae</i>	ATCC 4352	Cow's milk	57	62	23	54	61	28
28	<i>Klebsiella pneumoniae</i>	ATCC 13440	Not available	99	99	99	101	104	97
29	<i>Klebsiella pneumoniae</i>	QL 11007-7	Raw meat	64	85	82	70	78	79
30	<i>Kluyvera intermedia</i>	ATCC 33110	Surface water	16	34	2	19	31	3
31	<i>Pantoea agglomerans</i> <sup>g</sup>	ATCC 19552	Sewage	0	0	0	0	0	0
32	<i>Rahnella aquatilis</i>	ATCC 55046	Soil	6	17	1	5	17	1
33	<i>Serratia liquefaciens</i> <sup>g</sup>	ATCC 27592	Milk	52	70	80	55	67	74
34	<i>Serratia marcescens</i> <sup>g</sup>	QL 11007-1	Bottled water	43	53	76	48	54	71
35	<i>Serratia marcescens</i> <sup>g</sup>	ATCC 14756	Human isolate	79	79	70	78	74	70
36	<i>Serratia marcescens</i> <sup>g</sup>	ATCC 13880	Human isolate	34	4	40	39	41	41
37	<i>Escherichia coli</i> <sup>h</sup>	QL 16160-1	Mixed frozen vegetables	64	51	80	64	54	76
38	<i>Escherichia coli</i>	QL 16160-2	Frozen greens	84	91	94	80	84	89
39	<i>Escherichia coli</i>	QL 16160-3	Chicken nuggets	66	88	73	68	84	72
40	<i>Escherichia coli</i>	QL 16160-4	Beef carcass sponge	31	42	52	36	43	54
42	<i>Escherichia coli</i>	QL 16160-6	Flavored seasoning	41	45	48	43	46	50
43	<i>Escherichia coli</i>	QL 16160-7	Chicken carcass rinsate	57	46	48	55	49	52
44	<i>Escherichia coli</i>	QL16160-8	Fresh baby spinach	55	40	40	32	39	38
45	<i>Escherichia coli</i>	QL 16160-9	Raw pork	82	91	77	86	90	77

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46	<i>Escherichia coli</i>	QL 16160-10	Raw beef trimmings	41	42	47	42	44	45
47	<i>Escherichia coli</i>	QL 16160-11	Raw beef trimmings	37	49	53	35	48	49
48	<i>Escherichia coli</i>	QL 16160-12	Irrigation rinsate water	25	38	46	27	33	38
49	<i>Escherichia coli</i>	QL 16160-13	Beef carcass sponge	10	8	13	8	9	11
50	<i>Escherichia coli</i>	QL 16160-14	Chicken carcass rinsate	36	46	36	36	44	38

<sup>a</sup>Typical red coliform colonies produced but without gas production

<sup>b</sup>ATCC: American Type Culture Collection, Manassas, VA.

<sup>c</sup>Origin not available.

<sup>d</sup>QL: Q Laboratories Culture Collection, Cincinnati, OH.

<sup>e</sup>NBRC: NITE Biological Resource Center, Tokyo, Japan.

<sup>f</sup>NCTC: National Collection Type Cultures, Porton Down, Salisbury, UK.

<sup>g</sup>Isolate not detected on 3M™ Petrifilm Rapid *E. coli*/Coliform Count Plate and VRB.

<sup>h</sup>Typical blue, blue-green colonies produced for all *E. coli* strains tested

**Table 6. 3M Petrifilm Rapid *E. coli*/Coliform Count Plate: Coliform inclusivity results vs. ISO 4832:2006 (2)**

No.	Organism	Source	Origin	3M Petrifilm Rapid <i>E. coli</i> /Coliform Count Plate CFU/mL			ISO 4832:2006 CFU/mL		
				30°C	37°C	42°C	30°C	37°C	42°C
1	<i>Citrobacter amalonaticus</i> <sup>a</sup>	ATCC <sup>b</sup> 25405	Feces	70	94	88	74	89	86
2	<i>Citrobacter koseri</i> <sup>a</sup>	ATCC 27156	Not available <sup>c</sup>	41	33	36	42	36	33
3	<i>Citrobacter koseri</i> <sup>a</sup>	ATCC BAA-895	Clinical specimen - infant	99	96	96	99	92	91
4	<i>Citrobacter braakii</i> <sup>a</sup>	ATCC 43162	Clinical isolate, California	95	97	98	94	95	94
5	<i>Citrobacter farmeri</i> <sup>a</sup>	ATCC 51633	human feces, North Carolina	52	28	79	50	30	82
6	<i>Citrobacter freundii</i> <sup>a</sup>	QL <sup>d</sup> 100813-2A	Sliced deli meat (turkey)	98	98	98	96	96	96
7	<i>Citrobacter freundii</i> <sup>a</sup>	QL 11007-10	Clinical hospital	35	52	86	33	50	89
8	<i>Citrobacter freundii</i> <sup>a</sup>	ATCC 43864	Not available	19	23	23	15	26	25
9	<i>Citrobacter youngae</i> <sup>a</sup>	ATCC 11102	Not available	83	95	59	80	93	57
10	<i>Enterobacter aerogenes</i>	QL100813-1A	Raw vegetable	98	99	98	97	97	97
11	<i>Enterobacter aerogenes</i>	ATCC 13048	Sputum	82	84	80	85	81	79
12	<i>Enterobacter aerogenes</i>	ATCC 35029	Not available	80	49	83	80	44	82
13	<i>Enterobacter amnigenus</i>	ATCC 51816	Milk, Minnesota	29	4	1	30	3	3
14	<i>Enterobacter cancerogenus</i>	QL 11010-2	Bottled water	46	52	39	42	50	41
15	<i>Enterobacter cancerogenus</i>	QL 11010-1	Bottled water	33	57	59	30	59	56
16	<i>Enterobacter cloacae</i>	QL 100813-3A	Soy protein	98	98	99	99	93	94
17	<i>Enterobacter cloacae</i>	ATCC 13047	Spinal fluid	98	97	98	97	96	97
18	<i>Enterobacter cloacae</i>	NBRC <sup>e</sup> 13535	Spinal fluid	98	33	98	95	32	96
19	<i>Enterobacter cloacae</i>	NBRC 13536	Not Available	7	33	87	6	36	88
20	<i>Enterobacter gergoviae</i>	ATCC 33028	Urine, France	67	94	30	64	97	31
21	<i>Hafnia alvei</i>	ATCC 51815	Milk	69	77	8	68	78	9
22	<i>Klebsiella oxytoca</i>	ATCC 51817	Milk	41	45	41	41	49	42
23	<i>Klebsiella oxytoca</i>	ATCC 11686	Not available	94	96	99	90	98	96
24	<i>Klebsiella oxytoca</i>	NCTC <sup>f</sup> 49334	Not available	35	48	19	31	50	21
25	<i>Klebsiella oxytoca</i>	ATCC 700324	Not available	88	79	55	84	80	56
26	<i>Klebsiella pneumoniae</i>	ATCC 11296	Not available	27	62	55	29	63	54
27	<i>Klebsiella pneumoniae</i>	ATCC 4352	Cow's milk	43	78	23	42	75	26
28	<i>Klebsiella pneumoniae</i>	ATCC 13440	Not available	97	99	99	96	99	97
29	<i>Klebsiella pneumoniae</i>	QL 11007-7	Raw meat	92	98	82	94	96	83
30	<i>Kluyvera intermedia</i>	ATCC 33110	Surface water	13	19	2	16	20	4
31	<i>Pantoea agglomerans</i> <sup>g</sup>	ATCC 19552	Sewage	0	0	0	0	0	0



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20	<i>Listeria welshimeri</i>	ATCC 43549	Soil	<1	<1	<1	<1	<1	<1
21	<i>Micrococcus luteus</i>	ATCC 10240	Air	<1	<1	<1	<1	<1	<1
22	<i>Pseudomonas aeruginosa</i>	ATCC 27853	Clinical isolate	<1	<1	<1	<1	<1	<1
23	<i>Pseudomonas aeruginosa</i>	ATCC 35554	Not available	<1	<1	<1	<1	<1	<1
24	<i>Pseudomonas fluorescens</i>	QL 17041-3	Raw milk isolate	<1	<1	<1	<1	<1	<1
25	<i>Staphylococcus hominis</i>	ATCC 27844	Human skin	<1	<1	<1	<1	<1	<1
26	<i>Staphylococcus aureus</i>	ATCC 6538	Human lesion	<1	<1	<1	<1	<1	<1
27	<i>Streptococcus pneumoniae</i>	ATCC 6302	Not available	<1	<1	<1	<1	<1	<1
28	<i>Streptococcus pyogenes</i>	ATCC 19615	Pharynx of child following sore throat.	<1	<1	<1	<1	<1	<1
29	<i>Vibrio parahaemolyticus</i>	ATCC 17802	Shirasu food poisoning	<1	<1	<1	<1	<1	<1
30	<i>Vibrio vulnificus</i>	QL 021111A	Seafood product	<1	<1	<1	<1	<1	<1

<sup>a</sup>ATCC: American Type Culture Collection, Manassas, VA.

<sup>b</sup>QL: Q Laboratories Culture Collection, Cincinnati, OH.

<sup>c</sup>Origin not available

Table 8. 3M Petrifilm Rapid *E. coli*/Coliform Count Plate: Coliform exclusivity results vs. ISO 4832:2006 (2)

No.	Organism	Source	Origin	3M Petrifilm Rapid <i>E. coli</i> /Coliform Count Plate			ISO 4832:2006 CFU/mL		
				CFU/mL			30°C	37°C	42°C
1	<i>Acinetobacter baumannii</i>	ATCC <sup>a</sup> 19606	Urine	<1	<1	<1	<1	<1	<1
2	<i>Aeromonas viridans</i>	QL <sup>b</sup> 17041-8	Raw milk isolate	<1	<1	<1	<1	<1	<1
3	<i>Alcaligenes faecalis</i>	ATCC 8750	Not available <sup>c</sup>	<1	<1	<1	<1	<1	<1
4	<i>Bacillus cereus</i>	ATCC 6464	Soil	<1	<1	<1	<1	<1	<1
5	<i>Bacillus subtilis</i>	ATCC 6633	Not available	<1	<1	<1	<1	<1	<1
6	<i>Bordetella bronchiseptica</i>	ATCC 10580	Lung of dog	<1	<1	<1	<1	<1	<1
7	<i>Brochothrix thermosphacta</i>	ATCC 11509	Animal-derived foodstuff	<1	<1	<1	<1	<1	<1
8	<i>Enterococcus durans</i>	ATCC 19432	Not available	<1	<1	<1	<1	<1	<1
9	<i>Enterococcus faecalis</i>	ATCC 29212	Urine	<1	<1	<1	<1	<1	<1
10	<i>Enterococcus faecium</i>	ATCC 51559	Clinical isolate	<1	<1	<1	<1	<1	<1
11	<i>Enterococcus hirae</i>	ATCC 8043	Not available	<1	<1	<1	<1	<1	<1
12	<i>Haemophilus influenzae</i>	ATCC 19418	Not available	<1	<1	<1	<1	<1	<1
13	<i>Kurthia gibsonii</i>	ATCC 43195	Meat	<1	<1	<1	<1	<1	<1
14	<i>Kurthia zopfii</i>	ATCC 10538	Not available	<1	<1	<1	<1	<1	<1
15	<i>Leuconostoc mesenteroides</i>	ATCC 8293	Fermenting olives	<1	<1	<1	<1	<1	<1
16	<i>Listeria innocua</i>	ATCC 33090	Cow brain	<1	<1	<1	<1	<1	<1
17	<i>Listeria ivanovii</i>	ATCC BAA-139	Washing water	<1	<1	<1	<1	<1	<1
18	<i>Listeria monocytogenes</i>	ATCC 7644	Clinical isolate	<1	<1	<1	<1	<1	<1
19	<i>Listeria seeligeri</i>	ATCC 11289	Human feces	<1	<1	<1	<1	<1	<1
20	<i>Listeria welshimeri</i>	ATCC 43549	Soil	<1	<1	<1	<1	<1	<1
21	<i>Micrococcus luteus</i>	ATCC 10240	Air	<1	<1	<1	<1	<1	<1
22	<i>Pseudomonas aeruginosa</i>	ATCC 27853	Clinical isolate	<1	<1	<1	<1	<1	<1
23	<i>Pseudomonas aeruginosa</i>	ATCC 35554	Not available	<1	<1	<1	<1	<1	<1
24	<i>Pseudomonas fluorescens</i>	QL 17041-3	Raw milk isolate	<1	<1	<1	<1	<1	<1
25	<i>Staphylococcus hominis</i>	ATCC 27844	Human skin	<1	<1	<1	<1	<1	<1
26	<i>Staphylococcus aureus</i>	ATCC 6538	Human lesion	<1	<1	<1	<1	<1	<1
27	<i>Streptococcus pneumoniae</i>	ATCC 6302	Not available	<1	<1	<1	<1	<1	<1
28	<i>Streptococcus pyogenes</i>	ATCC 19615	Pharynx of child following sore throat.	<1	<1	<1	<1	<1	<1
29	<i>Vibrio parahaemolyticus</i>	ATCC 17802	Shirasu food poisoning	<1	<1	<1	<1	<1	<1
30	<i>Vibrio vulnificus</i>	QL 021111A	Seafood product	<1	<1	<1	<1	<1	<1

<sup>a</sup>ATCC: American Type Culture Collection, Manassas, VA.<sup>b</sup>QL: Q Laboratories Culture Collection, Cincinnati, OH.<sup>c</sup>Origin not available

**Table 12. Matrix study: 3M Petrifilm Rapid *E. coli*/Coliform Count Plate vs BAM Chapter 4 – Total coliform count (2)**

Matrix	Cont. level <sup>a</sup>	3M Petrifilm Rapid <i>E. coli</i> /Coliform Count Plate			BAM <sup>c</sup> Chapter 4			Mean diff. <sup>f</sup>	95% CI <sup>g</sup>	
		Mean <sup>b</sup>	s <sub>r</sub> <sup>c</sup>	RSD <sub>r</sub> <sup>d</sup>	Mean	s <sub>r</sub>	RSD <sub>r</sub>		LCL <sup>h</sup>	UCL <sup>i</sup>
Pasteurized whole milk	Un <sup>k</sup>	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.818	0.094	5.170	1.959	0.143	7.312	-0.141	-0.293	0.008
	Med	2.671	0.198	7.413	2.782	0.179	6.286	-0.111	-0.200	-0.041
	High	3.681	0.261	7.079	3.738	0.163	4.360	-0.057	-0.247	0.113
Butter	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	2.444	0.078	3.210	2.301	0.108	4.673	0.142	0.060	0.225
	Med	3.279	0.171	5.217	3.265	0.179	5.476	0.013	-0.069	0.092
	High	4.236	0.042	0.992	4.152	0.117	2.826	0.084	-0.060	0.224
Dry milk powder	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	2.016	0.292	14.16	1.904	0.071	3.731	0.157	-0.139	0.440
	Med	2.846	0.207	7.275	2.649	0.211	7.947	0.197	0.055	0.312
	High	3.907	0.212	5.413	3.719	0.159	4.263	0.188	0.051	0.314
Raw ground pork	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.979	0.175	8.855	1.993	0.144	7.235	-0.015	-0.170	0.140
	Med	3.095	0.133	4.303	2.986	0.113	3.776	0.109	-0.007	0.218
	High	4.088	0.139	3.409	4.022	0.152	3.777	0.066	0.022	0.102
Lamb chop	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	3.276	0.145	4.413	3.279	0.193	5.871	-0.003	-0.099	0.088
	Med	4.391	0.199	4.529	4.361	0.154	3.539	0.030	-0.041	0.100
	High	5.666	0.060	1.066	5.671	0.112	1.967	-0.005	-0.122	0.111
Raw ground chicken	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	2.042	0.057	2.823	2.027	0.055	2.689	0.016	-0.064	0.095
	Med	3.211	0.029	0.888	3.111	0.060	1.937	0.101	0.000	0.197
	High	4.237	0.114	2.686	4.165	0.075	1.810	0.071	-0.009	0.147
Chicken carcass rinsate	Low	2.483	0.171	6.897	2.443	0.186	7.594	0.040	-0.055	0.121
	Med	3.697	0.138	3.733	3.705	0.178	4.804	-0.007	-0.118	0.104
	High	5.023	0.081	1.613	5.044	0.103	2.048	-0.021	-0.073	0.024
Shell eggs	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.711	0.239	13.99	1.399	0.172	12.32	0.312	0.038	0.601
	Med	2.540	0.067	2.618	2.324	0.069	2.963	0.216	0.128	0.283
	High	3.583	0.092	2.576	3.239	0.039	1.209	0.344	0.253	0.412

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	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
Liquid egg whites	Low	1.704	0.061	3.590	1.569	0.228	14.50	0.135	-0.174	0.453
	Med	2.841	0.159	5.610	2.437	0.094	3.862	0.404	0.122	0.674
	High	3.680	0.111	3.006	3.465	0.049	1.399	0.215	0.018	0.397
	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
Powdered egg whites	Low	1.724	0.140	8.105	1.764	0.089	5.057	-0.040	-0.237	0.156
	Med	2.812	0.036	1.284	2.786	0.100	3.603	0.026	-0.121	0.161
	High	3.566	0.233	6.536	3.581	0.181	5.065	-0.015	-0.175	0.119
	Low	4.837	0.101	2.082	4.869	0.067	1.374	-0.032	-0.115	0.050
Sprouts	Med	5.832	0.098	1.687	5.825	0.094	1.616	0.007	-0.060	0.074
	High	6.656	0.116	1.746	6.690	0.100	1.488	-0.034	-0.138	0.069
	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
Cranberries	Low	1.626	0.089	5.481	1.497	0.159	10.63	0.130	-0.086	0.353
	Med	2.768	0.174	6.286	2.769	0.109	3.936	-0.001	-0.125	0.123
	High	3.650	0.219	5.990	3.713	0.060	1.621	-0.063	-0.356	0.209
	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
Infant formula with probiotics	Low	1.860	0.140	7.509	1.911	0.272	14.21	-0.052	-0.254	0.151
	Med	2.624	0.189	7.216	2.731	0.085	3.101	-0.108	-0.355	0.119
	High	3.531	0.244	6.906	3.654	0.199	5.454	-0.122	-0.445	0.173
	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
Infant formula without probiotics	Low	1.760	0.109	6.208	1.858	0.076	4.114	-0.098	-0.268	0.069
	Med	2.744	0.110	4.018	2.580	0.180	6.960	0.165	0.015	0.300
	High	3.706	0.135	3.654	3.504	0.091	2.606	0.203	0.035	0.355
	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
Gerber rice cereal without probiotics	Low	2.131	0.342	16.07	2.123	0.198	9.331	0.008	-0.236	0.240
	Med	3.413	0.180	5.282	3.228	0.190	5.898	0.185	0.067	0.280
	High	4.210	0.231	5.474	4.194	0.185	4.408	0.017	-0.080	0.108
	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
Dry dog kibble	Low	1.682	0.164	9.764	1.708	0.247	14.47	-0.025	-0.265	0.214
	Med	2.623	0.105	3.998	2.313	0.144	6.233	0.310	0.017	0.586
	High	3.525	0.145	4.121	3.362	0.177	5.269	0.163	-0.025	0.324
	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
Dry cat food	Low	1.893	0.075	3.945	1.800	0.122	6.748	0.093	-0.023	0.211
	Med	2.859	0.068	2.359	2.584	0.185	7.146	0.276	0.047	0.494

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	High	3.832	0.086	2.250	3.687	0.172	4.670	0.145	0.021	0.259
Flour	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.835	0.068	3.677	1.906	0.054	2.829	-0.071	-0.202	0.058
	Med	2.802	0.114	4.080	2.640	0.087	3.311	0.162	-0.035	0.347
	High	3.701	0.160	4.313	3.716	0.128	3.435	-0.015	-0.260	0.213
Chocolate chip cookie dough	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	2.727	0.078	2.860	2.734	0.081	2.963	-0.007	-0.124	0.110
	Med	3.369	0.083	2.462	3.383	0.095	2.811	-0.015	-0.187	0.155
	High	4.240	0.062	1.460	4.127	0.151	3.654	0.113	-0.046	0.271
Raw ground beef (73% lean)	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.574	0.146	9.304	1.569	0.228	14.50	0.005	-0.277	0.288
	Med	2.506	0.119	4.764	2.476	0.169	6.838	0.030	-0.096	0.131
	High	4.530	0.128	2.819	4.596	0.091	1.982	-0.065	-0.219	0.064
Raw frozen chicken wings	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.848	0.062	3.334	1.917	0.045	2.333	-0.070	-0.132	-0.009
	Med	2.867	0.097	3.381	2.799	0.151	5.407	0.068	-0.083	0.209
	High	4.883	0.066	1.360	4.922	0.032	0.650	-0.039	-0.129	0.040
Raw milk	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	2.819	0.151	5.357	2.905	0.122	4.209	-0.085	-0.229	0.046
	Med	3.600	0.172	4.778	3.609	0.079	2.189	-0.009	-0.149	0.131
	High	4.280	0.080	1.875	4.251	0.072	1.686	0.029	-0.060	0.113
Whole liquid egg	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.883	0.066	3.526	1.854	0.104	5.601	0.029	-0.137	0.219
	Med	2.810	0.055	1.960	2.763	0.226	8.167	0.047	-0.211	0.292
	High	4.861	0.051	1.050	4.854	0.091	1.882	0.007	-0.143	0.145
Tuna sushi	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.967	0.040	2.023	2.041	0.111	5.449	-0.074	-0.224	0.075
	Med	2.854	0.158	5.526	2.845	0.069	2.419	0.009	-0.187	0.194
	High	4.754	0.043	0.896	4.680	0.024	0.510	0.074	0.009	0.127
Smoked salmon	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.857	0.087	4.688	1.893	0.075	3.945	-0.036	-0.168	0.095
	Med	2.799	0.030	1.054	2.777	0.057	2.054	0.021	-0.039	0.069
	High	4.819	0.088	1.818	4.822	0.124	2.570	-0.003	-0.084	0.065
Bunched spinach	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA



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	Low	2.701	0.086	3.198	2.417	0.100	4.154	0.284	0.135	0.418
	Med	3.541	0.045	1.276	3.241	0.106	3.257	0.300	0.178	0.420
	High	4.408	0.076	1.717	4.346	0.021	0.484	0.062	-0.042	0.163
	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
Pasteurized carrot juice	Low	1.929	0.028	1.436	1.894	0.065	3.408	0.035	-0.072	0.143
	Med	2.883	0.066	2.303	2.895	0.052	1.788	-0.012	-0.086	0.052
	High	4.861	0.051	1.050	4.910	0.066	1.351	-0.049	-0.173	0.063
	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
Ready-made-sandwiches	Low	1.858	0.076	4.114	1.894	0.065	3.408	-0.036	-0.119	0.046
	Med	2.850	0.044	1.530	2.812	0.102	3.620	0.038	-0.119	0.183
	High	4.794	0.072	1.504	4.863	0.090	1.859	-0.068	-0.235	0.086
	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
Raw vegetable with dressing	Low	1.872	0.055	2.917	1.872	0.055	2.917	0.000	-0.095	0.095
	Med	2.823	0.056	1.969	2.855	0.082	2.873	-0.032	-0.081	0.005
	High	4.808	0.076	1.580	4.858	0.105	2.164	-0.050	-0.221	0.108
	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
Chicken feed	Low	1.764	0.089	5.058	1.867	0.097	5.192	-0.103	-0.134	0.075
	Med	2.842	0.099	3.496	2.900	0.087	3.002	-0.058	-0.107	-0.021
	High	4.894	0.065	1.319	4.802	0.094	1.958	0.092	-0.053	0.228
	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
Soybean meal	Low	1.810	0.134	7.413	1.810	0.134	7.413	0.000	-0.161	0.161
	Med	2.836	0.052	1.837	2.816	0.066	2.327	0.020	-0.062	0.091
	High	4.823	0.056	1.153	4.856	0.121	2.484	-0.033	-0.166	0.089
	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
Stainless steel	Low	2.628	0.300	11.41	2.777	0.049	1.765	-0.148	-0.584	0.264
	Med	3.673	0.106	2.874	3.647	0.033	0.917	0.026	-0.083	0.125
	High	4.298	0.078	1.805	4.542	0.094	2.076	-0.244	-0.386	0.105
	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
Sealed concrete	Low	1.642	0.111	6.757	1.717	0.212	12.35	-0.075	-0.290	0.138
	Med	2.714	0.105	3.885	2.867	0.070	2.432	-0.153	-0.250	-0.071
	High	4.682	0.095	2.019	4.833	0.084	1.738	-0.151	-0.243	-0.076

<sup>a</sup>All matrices are artificially contaminated when an uncontaminated (Un) level is reported.

<sup>b</sup>Mean of five replicate portions, plated in duplicate, after logarithmic transformation:  $\text{Log}_{10}[\text{CFU/g} + (0.1)\text{f}]$ .

<sup>c</sup>Repeatability standard deviation.

<sup>d</sup>Relative standard deviation for repeatability. Reported as a percentage.

<sup>e</sup>U.S. Food and Drug Administration *Bacteriological Analytical Manual*, Chapter 4, Enumeration of *Escherichia coli* and the Coliform Bacteria.

<sup>f</sup>Mean difference between the candidate and reference methods.

<sup>g</sup>Confidence interval based on paired statistical analysis.

<sup>h</sup>95% Lower confidence limit for difference of means.

<sup>i</sup>95% Upper confidence limit for difference of means.

<sup>k</sup>Uncontaminated matrix sample

**Table 13. Matrix study: 3M Petrifilm Rapid *E. coli*/Coliform Count Plate vs BAM Chapter 4 – *E. coli* count (2)**

Matrix	Cont. level <sup>a</sup>	3M Petrifilm Rapid <i>E. coli</i> /Coliform Count Plate			BAM <sup>c</sup> Chapter 4			Mean diff. <sup>f</sup>	95% CI <sup>g</sup>	
		Mean <sup>b</sup>	s <sub>r</sub> <sup>c</sup>	RSD <sub>r</sub> <sup>d</sup>	Mean	s <sub>r</sub>	RSD <sub>r</sub>		LCL <sup>h</sup>	UCL <sup>i</sup>
Pasteurized whole milk	Un <sup>k</sup>	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.506	0.119	7.927	1.358	0.215	15.86	0.148	0.021	0.289
	Med	2.382	0.240	10.06	2.397	0.205	8.535	-0.015	-0.262	0.194
	High	3.377	0.246	7.269	3.359	0.194	5.787	0.018	-0.264	0.259
Butter	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	2.243	0.134	5.958	1.996	0.195	9.764	0.248	0.108	0.391
	Med	2.942	0.246	8.365	2.878	0.187	6.499	0.064	-0.323	0.418
	High	3.937	0.043	2.096	3.835	0.192	5.006	0.103	-0.138	0.334
Dry milk powder	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.891	0.226	11.95	1.666	0.078	4.693	0.225	-0.028	0.468
	Med	2.489	0.375	15.07	2.423	0.238	9.830	0.066	-0.317	0.414
	High	3.672	0.303	8.254	3.414	0.172	5.039	0.259	0.070	0.435
Raw ground pork	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.608	0.175	10.91	1.565	0.218	13.93	0.043	-0.296	0.385
	Med	2.372	0.108	4.543	2.442	0.083	3.415	-0.071	-0.177	0.035
	High	3.208	0.100	3.125	3.222	0.193	5.999	-0.014	-0.235	0.235
Lamb chop	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	2.817	0.015	0.537	2.862	0.072	2.498	-0.045	-0.138	0.047
	Med	4.088	0.171	4.182	4.053	0.163	4.032	0.035	-0.122	0.185
	High	5.177	0.046	0.884	5.329	0.160	3.002	-0.152	-0.378	0.069
Raw ground chicken	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.848	0.137	7.409	1.749	0.091	5.224	0.100	-0.060	0.262
	Med	2.642	0.111	4.200	2.696	0.044	1.613	-0.054	-0.153	0.025
	High	3.973	0.073	1.848	3.928	0.076	1.928	0.045	-0.019	0.100
Chicken carcass rinsate	Low	2.179	0.133	6.094	2.081	0.217	10.44	0.099	-0.068	0.267
	Med	3.414	0.123	3.594	3.394	0.159	4.689	0.020	-0.105	0.132

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	High	4.642	0.111	2.390	4.755	0.136	2.869	-0.113	-0.237	-0.008
Shell eggs	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.382	0.240	17.34	1.098	0.126	11.44	0.285	0.036	0.562
	Med	2.322	0.000	0.000	2.131	0.076	3.586	0.191	0.078	-0.269
	High	3.266	0.126	3.845	3.036	0.155	5.094	0.230	-0.068	0.480
Liquid egg whites	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.322	0.000	0.000	1.268	0.239	18.806	0.054	-0.251	0.371
	Med	2.549	0.148	5.819	2.320	0.114	4.917	0.230	-0.081	0.518
	High	3.356	0.076	2.254	3.344	0.061	1.825	0.012	-0.151	0.138
Powdered egg whites	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.414	0.133	9.406	1.417	0.289	20.37	-0.003	-0.229	0.228
	Med	2.497	0.159	6.375	2.405	0.114	4.758	0.092	-0.097	0.254
	High	3.268	0.239	7.297	3.232	0.226	6.990	0.036	-0.104	0.122
Sprouts	Low	4.534	0.109	2.412	4.549	0.082	1.810	-0.014	-0.182	0.154
	Med	5.539	0.109	1.966	5.520	0.104	1.886	0.019	-0.019	0.057
	High	6.393	0.150	2.349	6.341	0.119	1.874	0.051	-0.138	0.239
Cranberries	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.266	0.126	9.920	1.154	0.154	13.33	0.112	-0.084	0.323
	Med	2.392	0.222	9.262	2.414	0.178	7.375	-0.022	-0.191	0.110
	High	3.334	0.184	5.519	3.296	0.127	3.854	0.038	-0.153	0.185
Infant formula with probiotics	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.608	0.175	10.91	1.552	0.294	18.97	0.056	-0.182	0.302
	Med	2.300	0.162	7.044	2.312	0.176	7.621	-0.012	-0.167	0.100
	High	3.287	0.274	8.332	3.329	0.306	9.179	-0.042	-0.418	0.282
Infant formula without probiotics	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.457	0.188	12.91	1.507	0.198	13.156	-0.049	-0.444	0.342
	Med	2.467	0.159	6.441	2.305	0.209	9.084	0.162	-0.062	0.234
	High	3.380	0.130	3.844	3.238	0.151	4.676	0.142	-0.192	0.440
Gerber rice cereal without probiotics	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.390	0.093	6.666	1.624	0.232	14.30	-0.234	-0.588	0.108
	Med	2.613	0.216	8.250	2.777	0.265	9.552	-0.165	-0.610	0.259
	High	3.591	0.298	8.309	3.780	0.228	6.026	-0.190	-0.493	0.088
Dry dog kibble	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.382	0.240	17.34	1.358	0.215	15.86	0.024	-0.246	0.296

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	Med	2.356	0.076	3.211	2.086	0.064	3.063	0.270	0.089	0.418
	High	3.266	0.126	3.845	3.139	0.156	4.964	0.127	-0.104	0.308
Dry cat food	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.516	0.181	11.92	1.451	0.285	19.62	0.065	-0.115	0.252
	Med	2.472	0.146	5.892	2.306	0.283	12.26	0.166	-0.146	0.452
	High	3.568	0.164	4.589	3.270	0.179	5.467	0.298	0.162	0.559
	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
Flour	Low	1.516	0.181	11.92	1.623	0.105	6.462	-0.108	-0.387	0.166
	Med	2.530	0.128	5.047	2.278	0.250	10.98	0.252	-0.076	0.558
	High	3.390	0.093	2.733	3.322	0.256	7.708	0.068	-0.243	0.343
	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
Chocolate chip cookie dough	Low	2.448	0.125	5.109	2.439	0.169	6.944	0.009	-0.240	0.229
	Med	3.099	0.073	2.363	3.118	0.139	4.450	-0.019	-0.251	0.212
	High	3.967	0.109	2.734	3.845	0.098	2.538	0.122	0.004	0.231
	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
Raw ground beef (73% lean)	Low	1.266	0.126	9.920	1.268	0.239	18.81	-0.002	-0.263	0.263
	Med	2.203	0.105	4.749	2.105	0.081	3.843	0.098	0.006	0.191
	High	4.334	0.184	4.246	4.279	0.147	3.427	0.055	-0.147	0.211
	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
Raw frozen chicken wings	Low	1.589	0.054	3.418	1.602	0.108	6.758	-0.014	-0.127	0.099
	Med	2.574	0.146	5.689	2.559	0.136	5.331	0.015	-0.131	0.138
	High	4.602	0.108	2.353	4.623	0.103	2.232	-0.021	-0.150	0.125
	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
Raw milk	Low	2.435	0.163	6.687	2.411	0.257	10.66	0.024	-0.182	0.207
	Med	3.230	0.088	2.708	3.228	0.134	4.162	0.002	-0.119	0.134
	High	4.051	0.050	1.221	4.104	0.064	1.555	-0.053	-0.136	0.023
	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
Whole liquid egg	Low	1.589	0.054	3.418	1.599	0.199	12.42	-0.011	-0.214	0.193
	Med	2.457	0.188	7.655	2.459	0.238	9.666	-0.002	-0.162	0.128
	High	4.491	0.000	0.000	4.551	0.070	1.537	-0.059	-0.159	0.015
	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
Tuna sushi	Low	1.685	0.073	4.352	1.530	0.128	8.344	0.155	-0.089	0.406
	Med	2.535	0.198	7.796	2.553	0.047	1.849	-0.019	-0.251	0.188
	High	4.414	0.133	3.013	4.439	0.021	0.479	-0.025	-0.225	0.143
	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA

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Smoked salmon	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.549	0.148	9.575	1.599	0.121	7.550	-0.049	-0.197	0.095
	Med	2.424	0.093	3.822	2.510	0.070	2.801	-0.086	-0.158	-0.046
	High	4.497	0.159	3.539	4.569	0.126	2.758	-0.072	-0.199	0.027
Bunched spinach	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	2.530	0.128	5.047	2.236	0.117	5.221	0.295	0.079	0.489
	Med	3.348	0.068	2.016	3.013	0.113	3.735	0.335	0.201	0.466
	High	4.115	0.095	2.301	4.092	0.094	2.306	0.023	-0.140	0.164
Pasteurized carrot juice	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.608	0.077	4.777	1.632	0.042	2.598	-0.024	-0.134	0.085
	Med	2.589	0.054	2.098	2.612	0.081	3.114	-0.024	-0.127	0.059
	High	4.472	0.146	3.257	4.578	0.075	1.636	-0.106	-0.246	0.006
Ready-made-sandwiches	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.530	0.128	8.344	1.574	0.146	9.304	-0.043	-0.120	0.032
	Med	2.552	0.068	2.665	2.556	0.103	4.030	-0.004	-0.128	0.121
	High	4.472	0.146	3.257	4.586	0.099	2.158	-0.113	-0.227	-0.029
Raw vegetable with dressing	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.549	0.148	9.575	1.530	0.128	8.344	0.019	-0.144	0.182
	Med	2.559	0.098	3.844	2.578	0.072	2.802	-0.019	-0.141	0.080
	High	4.497	0.159	3.539	4.625	0.119	2.561	-0.129	-0.411	0.125
Chicken feed	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.414	0.133	9.406	1.506	0.119	7.927	-0.092	-0.206	0.016
	Med	2.584	0.183	7.077	2.620	0.118	4.497	-0.036	-0.160	0.065
	High	4.472	0.146	3.257	4.540	0.094	2.074	-0.067	-0.232	0.069
Soybean meal	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.472	0.146	9.895	1.491	0.172	11.55	-0.019	-0.182	0.144
	Med	2.472	0.146	5.892	2.531	0.068	2.674	-0.059	-0.214	0.068
	High	4.448	0.125	2.812	4.590	0.130	2.833	-0.142	-0.249	-0.066
Stainless steel	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	2.195	0.271	12.34	2.437	0.082	3.350	-0.241	-0.704	0.254
	Med	2.907	0.038	1.312	3.273	0.077	2.351	-0.366	-0.499	-0.244
	High	4.064	0.066	1.631	4.145	0.120	2.887	-0.081	-0.207	0.038
Sealed concrete	Un	0.000	NA	NA	0.000	NA	NA	NA	NA	NA
	Low	1.210	0.154	12.71	1.414	0.133	9.406	-0.204	-0.378	0.051

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Med	2.472	0.146	5.892	2.513	0.083	3.310	-0.041	-0.216	0.105
High	4.424	0.093	2.094	4.514	0.059	1.295	-0.091	-0.202	0.021

<sup>a</sup>All matrices are artificially contaminated when an uncontaminated (Un) level is reported.

<sup>b</sup>Mean of five replicate portions, plated in duplicate, after logarithmic transformation:  $\text{Log}_{10}[\text{CFU/g} + (0.1)\text{f}]$ .

<sup>c</sup>Repeatability standard deviation.

<sup>d</sup>Relative standard deviation for repeatability. Reported as a percentage.

<sup>e</sup>U.S. Food and Drug Administration *Bacteriological Analytical Manual*, Chapter 4, Enumeration of *Escherichia coli* and the Coliform Bacteria.

<sup>f</sup>Mean difference between the candidate and reference methods.

<sup>g</sup>Confidence interval based on paired statistical analysis.

<sup>h</sup>95% Lower confidence limit for difference of means.

<sup>i</sup>95% Upper confidence limit for difference of means.

<sup>k</sup>Uncontaminated matrix sample

**Table 14. Matrix study: 3M Petrifilm Rapid *E. coli*/Coliform Count Plate vs ISO 4832:2006 – Total coliform count (2)**

Matrix	Cont. level <sup>a</sup>	3M Petrifilm Rapid <i>E. coli</i> /Coliform Count Plate			ISO 4832:2006			Mean diff. <sup>f</sup>	95% CI <sup>g</sup>	
		Mean <sup>b</sup>	s <sub>r</sub> <sup>c</sup>	RSD <sub>r</sub> <sup>d</sup>	Mean	s <sub>r</sub>	RSD <sub>r</sub>		LCL <sup>h</sup>	UCL <sup>i</sup>
Raw ground beef (73% lean)	Low	1.801	0.077	4.275	1.852	0.077	4.158	-0.051	-0.140	0.038
	Med	2.721	0.112	4.116	2.724	0.107	3.928	-0.003	-0.066	0.061
	High	4.823	0.104	2.156	4.823	0.089	1.845	0.000	-0.022	0.022
Raw frozen chicken wings	Low	1.862	0.098	5.263	1.866	0.067	3.591	-0.004	-0.107	0.098
	Med	2.887	0.076	2.632	2.891	0.083	2.871	-0.004	-0.039	0.032
	High	4.865	0.067	1.377	4.869	0.055	1.130	-0.004	-0.033	0.025
Raw milk	Low	2.852	0.077	2.700	2.846	0.079	2.776	0.006	-0.045	0.058
	Med	3.725	0.092	2.470	3.695	0.135	3.654	0.029	-0.039	0.098
	High	4.415	0.061	1.382	4.449	0.042	0.944	-0.034	-0.069	0.001
Whole liquid egg	Low	1.850	0.095	5.135	1.842	0.062	3.366	0.008	-0.079	0.095
	Med	2.801	0.077	2.749	2.795	0.098	3.506	0.006	-0.029	0.041
	High	4.877	0.067	1.374	4.882	0.061	1.249	-0.005	-0.024	0.014
Tuna sushi	Low	1.979	0.066	3.335	1.932	0.059	3.054	0.047	-0.028	0.122
	Med	2.887	0.076	2.632	2.898	0.059	2.036	-0.011	-0.036	0.014
	High	4.852	0.077	1.587	4.863	0.077	1.583	-0.011	-0.036	0.014
Smoked salmon	Low	1.866	0.067	3.591	1.902	0.039	2.050	-0.037	-0.144	0.071
	Med	2.852	0.077	2.700	2.859	0.077	2.693	-0.007	-0.029	0.014
	High	4.814	0.078	1.620	4.828	0.068	1.408	-0.014	-0.037	0.009
Bunched spinach	Low	2.760	0.062	2.246	2.771	0.045	1.624	-0.011	-0.034	0.013
	Med	3.568	0.054	1.513	3.572	0.062	1.736	-0.004	-0.046	0.038
	High	4.420	0.075	1.697	4.446	0.032	0.720	-0.026	-0.080	0.027

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Pasteurized carrot juice	Low	1.912	0.045	2.354	1.924	0.028	1.455	-0.012	-0.067	0.044
	Med	2.887	0.076	2.632	2.900	0.065	2.241	-0.013	-0.028	0.002
	High	4.887	0.076	1.555	4.886	0.075	1.535	0.001	-0.018	0.019
Ready-made-sandwiches	Low	1.891	0.046	2.433	1.924	0.028	1.455	-0.033	-0.092	0.025
	Med	2.890	0.046	1.592	2.890	0.046	1.592	0.000	-0.021	0.021
	High	4.852	0.077	1.587	4.868	0.076	1.561	-0.016	-0.055	0.023
Raw veg with dressing	Low	1.877	0.067	3.570	1.891	0.046	2.433	-0.013	-0.076	0.050
	Med	2.887	0.076	2.632	2.909	0.064	2.200	-0.022	-0.052	0.008
	High	4.852	0.077	1.587	4.853	0.084	1.731	-0.001	-0.021	0.018
Chicken feed	Low	1.877	0.067	3.570	1.901	0.055	2.893	-0.024	-0.089	0.042
	Med	2.887	0.076	2.632	2.902	0.067	2.309	-0.015	-0.032	0.001
	High	4.934	0.028	0.567	4.908	0.049	0.998	0.025	-0.012	0.063
Soybean meal	Low	1.874	0.089	4.749	1.864	0.080	4.292	0.010	-0.043	0.063
	Med	2.900	0.055	1.897	2.909	0.053	1.822	-0.017	-0.026	-0.009
	High	4.852	0.077	1.587	4.881	0.077	1.578	-0.029	-0.084	0.025
Stainless steel	Low	2.563	0.226	8.818	2.717	0.063	2.319	-0.154	-0.414	0.106
	Med	3.631	0.146	4.021	3.626	0.079	2.179	0.005	-0.113	0.124
	High	4.303	0.107	2.487	4.477	0.097	2.167	-0.174	-0.303	-0.044
Sealed concrete	Low	1.831	0.053	2.895	1.863	0.088	4.724	-0.032	-0.154	0.090
	Med	2.877	0.067	2.329	2.894	0.062	2.142	-0.017	-0.084	0.049
	High	4.801	0.077	1.604	4.829	0.060	1.242	-0.029	-0.071	0.014

<sup>a</sup>All matrices are artificially contaminated. An uncontaminated level was not tested, as per ISO 16140-2, Microbiology of the food chain — Method validation — Part 2: Protocol for the validation of alternative (proprietary) methods against a reference method.

<sup>b</sup>Mean of five replicate portions, plated in duplicate, after logarithmic transformation:  $\text{Log}_{10}[\text{CFU/g} + (0.1)\text{f}]$ .

<sup>c</sup>Repeatability standard deviation.

<sup>d</sup>Relative standard deviation for repeatability. Reported as a percentage.

<sup>e</sup>ISO 4832:2006, Microbiology of food and animal feeding stuffs -- Horizontal methods for the enumeration of coliforms – Colony- count technique.

<sup>f</sup>Mean difference between the candidate and reference methods.

<sup>g</sup>Confidence interval based on paired statistical analysis.

<sup>h</sup>95% Lower confidence limit for difference of means.

<sup>i</sup>95% Upper confidence limit for difference of means

Table 15. Matrix study: 3M Petrifilm Rapid *E. coli*/Coliform Count Plate vs ISO 16649-2:2001 – *E. coli* count (2)

Matrix	Cont. level <sup>a</sup>	3M Petrifilm Rapid <i>E. coli</i> /Coliform Count Plate			ISO 16649-2:2001 <sup>c</sup>			Mean diff. <sup>f</sup>	95% CI <sup>g</sup>	
		Mean <sup>b</sup>	s <sub>r</sub> <sup>c</sup>	RSD <sub>r</sub> <sup>d</sup>	Mean	s <sub>r</sub>	RSD <sub>r</sub>		LCL <sup>h</sup>	UCL <sup>i</sup>
Raw ground beef (73% lean)	Low	1.642	0.053	3.228	1.693	0.088	5.198	-0.051	-0.179	0.078
	Med	2.456	0.064	2.606	2.432	0.119	4.893	0.024	-0.074	0.122
	High	4.572	0.189	4.134	4.589	0.144	3.138	-0.017	-0.097	0.062
Raw frozen chicken wings	Low	1.706	0.107	6.272	1.677	0.075	4.472	0.029	-0.088	0.147
	Med	2.578	0.108	4.189	2.567	0.107	4.168	0.010	-0.070	0.091
	High	4.676	0.075	1.604	4.682	0.105	2.243	-0.006	-0.053	0.041
Raw milk	Low	2.696	0.062	2.300	2.675	0.084	3.140	0.021	-0.025	0.066
	Med	3.543	0.077	2.173	3.518	0.083	2.359	0.026	-0.048	0.100
	High	4.152	0.082	1.975	4.115	0.081	1.968	0.038	-0.038	0.113
Whole liquid egg	Low	1.677	0.075	4.472	1.658	0.080	4.825	0.019	-0.081	0.120
	Med	2.692	0.088	3.269	2.659	0.088	3.310	0.033	0.006	0.060
	High	4.676	0.075	1.604	4.672	0.077	1.648	0.004	-0.038	0.046
Tuna sushi	Low	1.706	0.107	6.272	1.706	0.107	6.272	0.000	-0.134	0.134
	Med	2.598	0.097	3.734	2.575	0.116	4.505	0.023	-0.014	0.061
	High	4.578	0.110	2.403	4.589	0.070	1.525	-0.011	-0.073	0.051
Smoked salmon	Low	1.677	0.075	4.472	1.696	0.062	3.656	-0.019	-0.141	0.103
	Med	2.524	0.088	3.487	2.537	0.086	3.390	-0.013	-0.060	0.033
	High	4.498	0.121	2.690	4.540	0.098	2.159	-0.043	-0.074	-0.011
Bunched spinach	Low	2.424	0.069	2.847	2.452	0.069	2.814	-0.028	-0.064	0.007
	Med	3.328	0.108	3.245	3.351	0.087	2.596	-0.023	-0.055	0.008
	High	4.105	0.096	2.339	4.123	0.064	1.552	-0.018	-0.116	0.080
Pasteurized carrot juice	Low	1.741	0.093	5.342	1.725	0.092	5.333	0.016	-0.096	0.128
	Med	2.705	0.107	3.956	2.710	0.090	3.321	-0.005	-0.036	0.026
	High	4.554	0.136	2.986	4.563	0.101	2.213	-0.009	-0.085	0.067
Ready-made- sandwiches	Low	1.710	0.087	5.088	1.712	0.073	4.264	-0.002	-0.109	0.104
	Med	2.488	0.113	4.542	2.497	0.109	4.365	-0.008	-0.099	0.082
	High	4.562	0.094	2.060	4.567	0.129	2.825	-0.005	-0.075	0.065
Raw veg with dressing	Low	1.677	0.075	4.472	1.687	0.117	6.935	-0.010	-0.097	0.077
	Med	2.676	0.075	2.803	2.664	0.072	2.703	0.012	-0.039	0.063
	High	4.528	0.143	3.158	4.541	0.161	3.545	-0.013	-0.047	0.020
Chicken feed	Low	1.677	0.075	4.472	1.706	0.107	6.272	-0.029	-0.128	0.069



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	Med	2.725	0.092	3.376	2.703	0.086	3.182	0.022	0.008	0.036
	High	4.568	0.076	1.664	4.584	0.070	1.527	-0.017	-0.061	0.027
	Low	1.677	0.075	4.472	1.706	0.107	6.272	-0.029	-0.128	0.069
Soybean meal	Med	2.725	0.138	5.064	2.676	0.138	5.157	0.049	-0.027	0.124
	High	4.568	0.076	1.664	4.592	0.078	1.699	-0.025	-0.056	0.007
	Low	2.059	0.271	13.16	2.376	0.034	1.431	-0.317	-0.648	0.014
Stainless steel	Med	2.889	0.128	4.431	3.135	0.109	3.477	-0.246	-0.375	-0.117
	High	4.028	0.118	2.929	4.118	0.056	1.360	-0.090	-0.203	0.024
	Low	1.693	0.088	5.198	1.725	0.092	5.333	-0.033	-0.192	0.126
Sealed concrete	Med	2.570	0.143	5.564	2.565	0.115	4.483	0.005	-0.063	0.073
	High	4.451	0.097	2.179	4.505	0.077	1.709	-0.054	-0.089	-0.020

<sup>a</sup>All matrices are artificially contaminated. An uncontaminated level was not tested, as per ISO 16140-2, Microbiology of the food chain — Method validation — Part 2: Protocol for the validation of alternative (proprietary) methods against a reference method.

<sup>b</sup>Mean of five replicate portions, plated in duplicate, after logarithmic transformation:  $\text{Log}_{10}[\text{CFU/g} + (0.1)\text{f}]$ .

<sup>c</sup>Repeatability standard deviation.

<sup>d</sup>Relative standard deviation for repeatability. Reported as a percentage.

<sup>e</sup>ISO 16649-2:2001, Microbiology of food and animal feeding stuffs -- Horizontal methods for the enumeration of beta-glucuronidase-positive *Escherichia coli* -- Part 2: Colony-count technique at 44 degrees C using 5-bromo-4-chloro-3-indolyl beta-D-glucuronide.

<sup>f</sup>Mean difference between the candidate and reference methods.

<sup>g</sup>Confidence interval based on paired statistical analysis.

<sup>h</sup>95% Lower confidence limit for difference of means.

<sup>i</sup>95% Upper confidence limit for difference of means

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