

# Method Comparison of the 3M™ Petrifilm™ Rapid Yeast and Mold Count Plate Method for the Enumeration of Yeast and Mold

## Method Comparison Study

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Megan Boyle, M. Joseph Benzinger Jr., Paige Bedinghaus, Erin Crowley,  
Patrick Bird, James Agin, David Goins

Q Laboratories, Inc.  
1400 Harrison Avenue  
Cincinnati, OH 45214

A method comparison evaluation for the 3M™ Petrifilm™ Rapid Yeast and Mold Count (RYM) Plate method was conducted at Q Laboratories, Inc., Cincinnati, OH. The 3M Petrifilm RYM Plate method was compared to the ISO 21527:2008 Parts 1 and 2 and the FDA BAM Chapter 18 method for ten matrixes: yogurt, sour cream, almonds, sliced apples, frozen bread dough, ready-made pie, sandwiches, dehydrated soup, fermented salami and frozen ground beef patties. Naturally contaminated samples that covered three levels of contamination (low level 10–100 CFU/g, medium level 100–1,000 CFU/g and a high level 1,000–10,000 CFU/g) were analyzed. Matrixes that were not naturally contaminated were artificially contaminated with a yeast or mold, and five replicates were analyzed at four levels (uninoculated, low, medium and high). A paired t-test was conducted at the 95% confidence level for each matrix. No significant statistical difference was observed among the candidate and both the reference methods for four of the ten matrixes analyzed including yogurt, apples, ground beef and sausage. For five of the matrixes, sour cream, sandwiches, ready-made pie, almonds and frozen bread dough, a statistically significant difference was observed for the high level of detection. For almonds, a statistically significant difference was observed for the medium level at 48 hours. No significant statistical difference was observed for the low and medium levels for each of the additional four matrixes. For dehydrated soup, the 3M Petrifilm RYM Plate method recovered three separate levels of the target organism, but no recovery of the target analyte was detected by the reference methods. The 3M Petrifilm RYM Plate method demonstrated reliability as a rapid alternative for the enumeration of yeast and mold in as little as 48 hours.

**The 3M Petrifilm RYM Plate method was granted AOAC PTM #121301 for incubation from 25–28°C for 48 ± 2 hours.**

This report presents the quantitative results for the comparison of the 3M™ Petrifilm™ Rapid Yeast and Mold Count (RYM) Plate method to the ISO 21527-1:2008 *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of yeasts and moulds — Part 1: Colony count technique in products with water activity greater than 0.95* and ISO 21527-2:2008 *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of yeasts and moulds — Part 2: Colony count technique in products with water activity less than or equal to 0.95* method and FDA-BAM Chapter 18: *Yeasts, Molds and Mycotoxins* method for the enumeration of yeast and mold. All analyses were conducted at Q Laboratories, Inc. (Cincinnati, OH). All test kits and proprietary media unique to the 3M Petrifilm RYM Plate method were provided by 3M Food Safety Department (St. Paul, MN).

## ► Materials and Methods

The methodology for this study was followed as outlined in the AOAC® Research Institute *Performance Tested Method*<sup>SM</sup> Program Protocol: *Validation Outline for 3M Petrifilm Rapid Yeast and Mold Count Plate Method*. The validation included a method comparison for ten matrixes (yogurt, sour cream, almonds, sliced apples, frozen bread dough, ready-made pie, sandwiches, dehydrated soup, fermented salami and frozen ground beef patties). Using paired test portions, the 3M Petrifilm RYM Plate method

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was compared to the ISO 21527:2008 Parts 1 and 2 method and FDA-BAM Chapter 18 method for the enumeration of yeast and mold in food. For each matrix, a minimum three lots were analyzed for the presence of the target analytes. Matrices containing naturally occurring yeasts and molds were temperature abused in order to get three distinctive lots. Naturally contaminated foods (frozen bread dough, sliced apples, sandwiches) had a target contamination level of low (10–100 CFU/g), medium (100–1,000 CFU/g) and high (1,000–10,000 CFU/g level). For the sliced apples, naturally contaminated lots were held at 2–5°C for one week and diluted with uncontaminated product to reduce contamination levels. Frozen bread dough was diluted with uncontaminated product to reduce contamination levels. The sandwiches were held at 2–5°C for 48 hours, for one to two weeks to achieve three separate lots of contamination. A total of four lots each of artificially contaminated matrixes (yogurt, sour cream, almonds, ready-made pie, dehydrated soup, fermented salami and frozen ground beef patties) were analyzed for the target analyte at the following target levels: uninoculated (0 CFU/g), low (10–100 CFU/g), medium (100–1,000 CFU/g) and high (1,000–10,000 CFU/g). Frozen beef patties, yogurt and ready-made pie were inoculated with a broth culture. The broth culture was prepared by transferring a single colony to yeast mold (YM) broth for 48 hours at 30°C. The inoculated test portions were mixed thoroughly by hand kneading, then held to stabilize according to their food type. Perishable foods (yogurt, sour cream, ready-made pie and fermented salami) were refrigerated at 2–5°C for 48–72 hours to allow time for the organism to equilibrate within the matrix. Frozen beef patties were thawed, inoculated and held at -20 to -30°C for a minimum of two weeks. For shelf stable foods (almonds, dehydrated soup) a bulk lot of each matrix was inoculated with a lyophilized culture and stabilized for a minimum of two weeks at room temperature. The lyophilized mold cultures were purchased in pelleted form (Microbiologics, Inc) crushed and mixed into the test matrix. Table A represents the matrix preparation guidelines.

**Table A: Matrix Preparation Guidelines**

Matrix	Agar Type	Inoculating Organism	Stabilization	Target Yeast and Mold Levels	Replicates
Yogurt	DRBC	<i>Kluyveromyces lactis</i> ATCC 8563	2–4 Days 2–6°C	10–100 CFU/g	5
				100–1000 CFU/g	5
				1000–10,000 CFU/g	5
				0 CFU/g	5
Sour Cream	DRBC	<i>Geotrichum candidum</i> ATCC 34614	2–4 Days 2–6°C	10–100 CFU/g	5
				100–1000 CFU/g	5
				1000–10,000 CFU/g	5
				0 CFU/g	5
Almonds	DG18	<i>Aspergillus aculeatus</i> ATCC 56925	2 Weeks 25°C	10–100 CFU/g	5
				100–1000 CFU/g	5
				1000–10,000 CFU/g	5
				0 CFU/g	5
Sliced Apples	DRBC	Natural	N/A	10–100 CFU/g	5
				100–1000 CFU/g	5
				1000–10,000 CFU/g	5
Frozen Bread Dough	DRBC	Natural	N/A	10–100 CFU/g	5
				100–1000 CFU/g	5
				1000–10,000 CFU/g	5
Ready-Made Pie	DRBC	<i>Hansenula anomala</i> (3M-Y28)	2–4 Days 2–6°C	10–100 CFU/g	5
				100–1000 CFU/g	5
				1000–10,000 CFU/g	5
				0 CFU/g	5
Sandwiches	DRBC	Natural	N/A	10–100 CFU/g	5
				100–1000 CFU/g	5
				1000–10,000 CFU/g	5
Dehydrated Soup	DG18	<i>Paecilomyces spp</i> (3M-M10)	2 Weeks 25°C	10–100 CFU/g	5
				100–1000 CFU/g	5
				1000–10,000 CFU/g	5
				0 CFU/g	5
Frozen Ground Beef Patty	DRBC	<i>Trichosporon mucoides</i> ATCC 201382	2 Weeks -20 to -30°C	10–100 CFU/g	5
				100–1000 CFU/g	5
				1000–10,000 CFU/g	5
				0 CFU/g	5
Fermented Salami	DRBC	<i>Candida tropicalis</i> ATCC 13803	2–4 Days 2–6°C	10–100 CFU/g	5
				100–1000 CFU/g	5
				1000–10,000 CFU/g	5
				0 CFU/g	5

ISO 21527-1:2008 *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of yeasts and moulds — Part 1: Colony count technique in products with water activity greater than 0.95* and ISO 21527-2:2008 *Microbiology of food and animal feeding stuffs — Horizontal method for the enumeration of yeasts and moulds — Part 2: Colony count technique in products with water activity less than or equal to 0.95* method and FDA-BAM Chapter 18: *Yeasts, Molds and Mycotoxins*.

For the two reference methods ISO 21527 and FDA BAM, 25 gram test portions were diluted with 225mL of 0.1% peptone water in a sterile bag and stomached for two minutes. Serial dilutions were prepared in 0.1% peptone water and aliquots of each dilution were plated in triplicate on dichloran-rose bengal chloramphenicol agar (DRBC) or dichloran 18% glycerol (DG18) agar for low moisture foods. The agar plates were incubated for 5–7 days at 25°C. Total counts were enumerated by using a Quebec Colony Counter and results were reported by averaging counts between triplicate plates. Final results were presented as colony forming units per gram (CFU/g). The countable range for plates containing yeast and mold is 10–150 colonies.

### **3M Petrifilm Rapid Yeast and Mold Count Plate Method**

For the 3M Petrifilm RYM Plate method, paired test portions for each matrix were prepared as described in the ISO and FDA BAM reference methods. A 1mL aliquot of each sample dilution was placed on the 3M Petrifilm RYM Plate. The top film was gently lowered and the aliquot was spread with the 3M™ Petrifilm™ Flat Spreader. The plates were left undisturbed for one minute and incubated for  $48 \pm 2$  hours at  $25 \pm 1^\circ\text{C}$ . Typical colonies were enumerated and reported as CFU/g. The 3M Petrifilm RYM Plates were reincubated for an additional 12 hours (60 total hours) and then enumerated using a Quebec Colony Counter. Typical yeast colonies were small pink tan or blue green in color with defined edges. Typical mold colonies were large blue-green colonies with diffuse edges. The countable range for 3M Petrifilm RYM Plates containing yeast and mold is 10–150 colonies.

## **► Discussion**

For each matrix, the colony forming units/g were converted to log values and analyzed. The values were evaluated by a paired t-test for equal or unequal variances at a 95% confidence level to analyze statistical differences between the 3M Petrifilm RYM Plate method and the ISO and FDA BAM reference methods. Additionally, the repeatability ( $S_r$ ) of the 3M Petrifilm RYM Plate method and the reference methods was calculated by determination of the mean of the  $\log_{10}$  of the counts and the standard deviation,  $S_r$ , for each contamination level of each matrix.

### **Yogurt 48 Hours**

No statistically significant difference was observed between all three levels analyzed between the two methods. The p-values calculated at a 95% confidence level for the low, medium and high levels were 0.6343, 0.4648 and 0.6776, respectively. The 3M Petrifilm RYM Plate method had a higher repeatability value than the ISO and FDA BAM methods for the medium and high levels, with  $S_r$  values, respectively, of 0.0298 and 0.0850 for the medium level, and 0.0787 and 0.0895 for the high level. For the low level, the ISO and FDA BAM had higher repeatability value compared to the 3M Petrifilm RYM Plate method, with  $S_r$  values, respectively, of 0.0445 and 0.1026. Detailed results are presented in Table 1 of the Appendix.

### **Yogurt 60 Hours**

No statistically significant difference was observed between all three levels analyzed between the two methods. The p-values calculated at a 95% confidence level for the low, medium and high levels were 0.3350, 0.4633 and 0.6776, respectively. The 3M Petrifilm RYM Plate method had a higher repeatability value than the ISO and FDA BAM methods for the medium and high levels, with  $S_r$  values, respectively, of 0.0279 and 0.0850 for the medium level, and 0.0787 and 0.0895 for the high level. For the low level, the ISO and FDA BAM had higher repeatability value compared to the 3M Petrifilm RYM Plate method, with  $S_r$  values, respectively, of 0.0445 and 0.0934. Detailed results are presented in Table 2 of the Appendix.

## **Sour Cream 48 and 60 Hours**

No statistically significant difference was observed between two of the three levels analyzed between the two methods. The p-values calculated at a 95% confidence level for the low and medium levels were 0.3466 and 0.3007. The t-test indicated a significant difference between the 3M Petrifilm RYM Plate method and the ISO and FDA BAM methods on the high level with a p-value of 0.0457. For the high level, the mean averages were 2.9943 for the 3M Petrifilm RYM Plate method and 3.1259 for the ISO and FDA BAM methods. The 3M Petrifilm RYM Plate method had a higher repeatability value than the ISO and FDA BAM methods for the medium level, with  $S_r$  values, respectively, of 0.0681 and 0.0733. For the low and high level the ISO and FDA BAM had higher repeatability values compared to the 3M Petrifilm RYM Plate method, with  $S_r$  values, respectively, of 0.0000 and 0.3970 for the low level, and 0.0367 and 0.1050 for the high level. Detailed results are presented in Tables 3 of the Appendix.

## **Almonds 48 Hours**

No statistically significant difference was observed between one of the three levels analyzed between the two methods. The p-values calculated at a 95% confidence level for the low level was 0.1471. The t-test indicated a significant difference between the 3M Petrifilm RYM Plate method and the ISO and FDA BAM methods on the medium and high level with p-values of 0.0498 and 0.0045. The 3M Petrifilm RYM Plate method had a higher repeatability value than the ISO and FDA BAM methods for the low and high levels, with  $S_r$  values, respectively, of 0.0788 and 0.2220 for the low level, and 0.0331 and 0.0603 for the high level. For the medium level, the ISO and FDA BAM had higher repeatability values compared to the 3M Petrifilm RYM Plate method, with  $S_r$  values, respectively, of 0.0590 and 0.0984. Detailed results are presented in Table 4 of the Appendix.

## **Almonds 60 Hours**

No statistically significant difference was observed between two of the three levels analyzed between the two methods. The p-values calculated at a 95% confidence level for the low and medium levels were 0.1471 and 0.0661. The t-test indicated a significant difference between the 3M Petrifilm RYM Plate method and the ISO and FDA BAM methods on the high level with a p-value of 0.0045. The 3M Petrifilm RYM Plate method had a higher repeatability value than the ISO and FDA BAM methods for the low and high levels, with  $S_r$  values, respectively, of 0.0788 and 0.2220 for the low level, and 0.0331 and 0.0603 for the high level. For the medium level, the ISO and FDA BAM had higher repeatability values compared to the 3M Petrifilm RYM Plate method, with  $S_r$  values, respectively, of 0.0590 and 0.0885. Detailed results are presented in Table 5 of the Appendix.

## **Sliced Apples 48 Hours**

No statistically significant difference was observed between all three levels analyzed between the two methods. The p-values calculated at a 95% confidence level for the low, medium and high levels were 0.8546, 0.8583 and 0.1104, respectively. The 3M Petrifilm RYM Plate method had a higher repeatability value than the ISO and FDA BAM methods for the all levels, with  $S_r$  values, respectively, of 0.2519 and 0.3476 for the low level, 0.1769 and 0.2839 for the medium level, and 0.1187 and 0.1555 for the high level. Detailed results are presented in Table 6 of the Appendix.

### **Sliced Apples 60 Hours**

No statistically significant difference was observed between all three levels analyzed between the two methods. The p-values calculated at a 95% confidence level for the low, medium and high levels were 0.8546, 0.5615 and 0.1104, respectively. The 3M Petrifilm RYM Plate method had a higher repeatability value than the ISO and FDA BAM methods for the all levels, with  $S_r$  values, respectively, of 0.2519 and 0.3476 for the low level, 0.1580 and 0.2839 for the medium level, and 0.1187 and 0.1555 for the high level. Detailed results are presented in Table 7 of the Appendix.

### **Frozen Bread Dough 48 Hours**

No statistically significant difference was observed between two of the three levels analyzed between the two methods. The p-values calculated at a 95% confidence level for the low and medium levels were 0.9389 and 0.2490. The t-test indicated a significant difference between the 3M Petrifilm RYM Plate method and the ISO and FDA BAM methods on the high level with a p-value of 0.0020. The 3M Petrifilm RYM Plate method had a higher repeatability value than the ISO and FDA BAM methods for the medium and high levels, with  $S_r$  values, respectively, of 0.0628 and 0.2073 for the medium level, and 0.1136 and 0.1690 for the high level. For the low level, the ISO and FDA BAM had higher repeatability values compared to the 3M Petrifilm RYM Plate method, with  $S_r$  values, respectively, of 0.0873 and 0.1116. Detailed results are presented in Table 8 of the Appendix.

### **Frozen Bread Dough 60 Hours**

No statistically significant difference was observed between two of the three levels analyzed between the two methods. The p-values calculated at a 95% confidence level for the low and medium levels were 0.6873 and 0.2274. The t-test indicated a significant difference between the 3M Petrifilm RYM Plate method and the ISO and FDA BAM methods on the high level with a p-value of 0.0015. The 3M Petrifilm RYM Plate method had a higher repeatability value than the ISO and FDA BAM methods for the medium and high levels, with  $S_r$  values, respectively, of 0.0608 and 0.2073 for the medium level, and 0.1154 and 0.1690 for the high level. For the low level, the ISO and FDA BAM had higher repeatability values compared to the 3M Petrifilm RYM Plate method, with  $S_r$  values, respectively, of 0.0873 and 0.1054. Detailed results are presented in Table 9 of the Appendix.

### **Ready-Made Pie 48 Hours**

No statistically significant difference was observed between two of the three levels analyzed between the two methods. The p-values calculated at a 95% confidence level for the low and medium levels were 0.5370 and 0.7334. The t-test indicated a significant difference between the 3M Petrifilm RYM Plate method and the ISO and FDA BAM methods on the high level with a p-value of 0.0001. The 3M Petrifilm RYM Plate method had a higher repeatability value than the ISO and FDA BAM methods for the low, medium and high levels, with  $S_r$  values, respectively, of 0.1649 and 0.1783 for the low level, and 0.1381 and 0.1482 for the medium level, and 0.0324 and 0.0433 for the high level. Detailed results are presented in Table 10 of the Appendix.

## Ready-Made Pie 60 Hours

No statistically significant difference was observed between two of the three levels analyzed between the two methods. The p-values calculated at a 95% confidence level for the low and medium levels were 0.5370 and 0.6748. The t-test indicated a significant difference between the 3M Petrifilm RYM Plate method and the ISO and FDA BAM methods on the high level with a p-value of 0.0001. The 3M Petrifilm RYM Plate method had a higher repeatability value than the ISO and FDA BAM methods for the low, medium and high levels, with  $S_r$  values, respectively, of 0.1649 and 0.1738 for the low level, and 0.1341 and 0.1482 for the medium level, and 0.0282 and 0.0433 for the high level. Detailed results are presented in Table 11 of the Appendix.

## Sandwiches 48 Hours

No statistically significant difference was observed between two of the three levels analyzed between the two methods. The p-values calculated at a 95% confidence level for the low and medium levels were 0.6033 and 0.6367. The t-test indicated a significant difference between the 3M Petrifilm RYM Plate method and the ISO and FDA BAM methods on the high level with a p-value of 0.0242. The 3M Petrifilm RYM Plate method had a higher repeatability value than the ISO and FDA BAM methods for the high level, with  $S_r$  values, respectively, of 0.0451 and 0.1363. The ISO and FDA BAM methods had a higher repeatability values than the 3M Petrifilm RYM Plate method for the low and medium levels, with  $S_r$  values, respectively, of 0.2270 and 0.2692 for the low level, and 0.0522 and 0.1371 for the medium level. Detailed results are presented in Table 12 of the Appendix.

## Sandwiches 60 Hours

No statistically significant difference was observed between two of the three levels analyzed between the two methods. The p-values calculated at a 95% confidence level for the low and medium levels were 0.6033 and 0.6648. The t-test indicated a significant difference between the 3M Petrifilm RYM Plate method and the ISO and FDA BAM methods on the high level with a p-value of 0.0308. The 3M Petrifilm RYM Plate method had a higher repeatability value than the ISO and FDA BAM methods for the high level, with  $S_r$  values, respectively, of 0.0396 and 0.1363 for the high level. The ISO and FDA BAM method had a higher repeatability values than the 3M Petrifilm RYM Plate method for the low and medium levels, with  $S_r$  values, respectively, of 0.2270 and 0.2692 for the low level, and 0.0522 and 0.1275 for the medium level. Detailed results are presented in Table 13 of the Appendix.

## Dehydrated Soup 48 and 60 Hours

For dehydrated soup, the 3M Petrifilm RYM Plate method recovered three separate levels of the target organism, but no recovery of the target analyte was detected by the reference methods. The 3M RYM plates recovered an average of 1.2760 logs for the low level, with a standard deviation of 0.1721. The medium level had an average of 2.4234 logs with a standard deviation of 0.1132. The high level had an average of 2.9145 logs with a standard deviation of 0.1366. Only one typical colony morphology, large blue colonies with dark centers and diffuse edges, was observed on the 3M Petrifilm RYM Plates. That colony morphology matched the morphology of the inoculating organisms, *Paecilomyces*. Further macroscopic and microscopic investigation into the culture verified that it was *Paecilomyces*. Detailed results are in Table 14 of the Appendix.

### **Fermented Salami 48 Hours**

No statistical difference was observed between all three levels analyzed between the two methods. The p-values calculated at a 95% confidence level for the low, medium and high levels were 0.7354, 0.8313 and 0.0805, respectively. The ISO and FDA BAM method had a lower repeatability value than the 3M Petrifilm RYM Plate method for all three levels, with  $S_r$  values, respectively, of 0.4273 and 0.4671 for the low level, 0.0554 and 0.0843 for the medium level, and 0.0352 and 0.0385 for the high level. Detailed results are presented in Table 15 of the Appendix.

### **Fermented Salami 60 Hours**

No statistically significant difference was observed between all three levels analyzed between the two methods. The p-values calculated at a 95% confidence level for the low, and medium and high levels were 0.1461, 0.7194 and 0.0837, respectively. The ISO/FDA BAM method had a lower repeatability value than the 3M Petrifilm RYM Plate method for all levels, with  $S_r$  values, respectively, of 0.4273 and 0.5072 for the low level, and 0.0554 and 0.0686 for the medium level, and 0.0352 and 0.0481 for the high level. Detailed results are presented in Table 16 of the Appendix.

### **Frozen Ground Beef Patties 48 Hours**

No statistically significant difference was observed between all three levels analyzed between the two methods. The p-values calculated at a 95% confidence level for the low, medium and high levels were 0.0861, 0.7657 and 0.0613. The 3M Petrifilm RYM Plate method had a lower repeatability value than the ISO and FDA BAM methods for the medium and high levels, with  $S_r$  values, respectively, of 0.1215 and 0.1390 for the medium level, and 0.0276 and 0.0538 for the high level. The ISO and FDA BAM methods had lower repeatability values than the 3M Petrifilm RYM Plate method for the low level with  $S_r$  values respectively, of 0.1922 and 0.2270. Detailed results are presented in Table 17 of the Appendix.

### **Frozen Ground Beef Patties 60 Hours**

No statistically significant difference was observed between all three levels analyzed between the two methods. The p-values calculated at a 95% confidence level for the low, medium and high levels were 0.0840, 0.9330 and 0.0613. The 3M Petrifilm RYM Plate method had a lower repeatability value than the ISO and FDA BAM methods for the low, medium and high levels, with  $S_r$  values, respectively, of 0.1677 and 0.1922 for the low level, 0.1214 and 0.1390 for the medium level, and 0.0276 and 0.0538 for the high level. Detailed results are presented in Table 18 of the Appendix.

## **► Observations**

The study demonstrated the reliability of the 3M Petrifilm RYM Plate method when compared to ISO and FDA BAM for the enumeration of yeast and mold. The 3M Petrifilm RYM Plate is compact and easy to use. It reduces the amount of materials and analyst time spent on media production and limits the total amount of waste produced during the test. The colonies on the 3M Petrifilm RYM Plates are easy to differentiate and are ready for enumeration in as little as 48 hours compared to five days with the traditional plate count methods.

# APPENDIX

**Table 1:** Summary of Results for Yogurt Matrix Comparison 48 Hours

Level	Sample	3M™ Petrifilm™ Rapid Yeast and Mold Count Plate				ISO/FDA BAM				p-Value
		Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	
Uninoculated	1	<10	<0	—	—	<10	<0	—	—	N/A
	2	<10	<0			<10	<0			
	3	<10	<0			<10	<0			
	4	<10	<0			<10	<0			
	5	<10	<0			<10	<0			
Low	1	2.8 x 10 <sup>3</sup>	3.4472	3.4620	0.1026	2.6 x 10 <sup>3</sup>	3.4150	3.4868	0.0445	0.6343
	2	2.0 x 10 <sup>3</sup>	3.3010			3.2 x 10 <sup>3</sup>	3.5051			
	3	3.0 x 10 <sup>3</sup>	3.4771			3.0 x 10 <sup>3</sup>	3.4771			
	4	3.2 x 10 <sup>3</sup>	3.5051			3.2 x 10 <sup>3</sup>	3.5051			
	5	3.8 x 10 <sup>3</sup>	3.5798			3.4 x 10 <sup>3</sup>	3.5315			
Medium	1	2.9 x 10 <sup>4</sup>	4.4624	4.4208	0.0298	2.4 x 10 <sup>4</sup>	4.3802	4.4526	0.0850	0.4648
	2	2.4 x 10 <sup>4</sup>	4.3802			3.6 x 10 <sup>4</sup>	4.5563			
	3	2.7 x 10 <sup>4</sup>	4.4314			2.6 x 10 <sup>4</sup>	4.4150			
	4	2.6 x 10 <sup>4</sup>	4.4150			3.4 x 10 <sup>4</sup>	4.5315			
	5	2.6 x 10 <sup>4</sup>	4.4150			2.4 x 10 <sup>4</sup>	4.3802			
High	1	2.0 x 10 <sup>5</sup>	5.3010	5.2248	0.0787	2.2 x 10 <sup>5</sup>	5.3424	5.2478	0.0895	0.6776
	2	1.6 x 10 <sup>5</sup>	5.2041			1.6 x 10 <sup>5</sup>	5.2041			
	3	2.0 x 10 <sup>5</sup>	5.3010			2.2 x 10 <sup>5</sup>	5.3424			
	4	1.6 x 10 <sup>5</sup>	5.2041			1.4 x 10 <sup>5</sup>	5.1461			
	5	1.3 x 10 <sup>5</sup>	5.1139			1.6 x 10 <sup>5</sup>	5.2041			

**Table 2:** Summary of Results for Yogurt Matrix Comparison 60 Hours

Level	Sample	3M™ Petrifilm™ Rapid Yeast and Mold Count Plate				ISO/FDA BAM				p-Value
		Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	
Uninoculated	1	<10	<0	—	—	<10	<0	—	—	N/A
	2	<10	<0			<10	<0			
	3	<10	<0			<10	<0			
	4	<10	<0			<10	<0			
	5	<10	<0			<10	<0			
Low	1	2.8 x 10 <sup>3</sup>	3.4150	3.4393	0.0934	2.6 x 10 <sup>3</sup>	3.4150	3.4868	0.0445	0.3350
	2	2.0 x 10 <sup>3</sup>	3.3010			3.2 x 10 <sup>3</sup>	3.5051			
	3	2.8 x 10 <sup>3</sup>	3.4472			3.0 x 10 <sup>3</sup>	3.4771			
	4	3.0 x 10 <sup>3</sup>	3.4771			3.2 x 10 <sup>3</sup>	3.5051			
	5	3.6 x 10 <sup>3</sup>	3.5563			3.4 x 10 <sup>3</sup>	3.5315			
Medium	1	2.8 x 10 <sup>4</sup>	4.4472	4.4209	0.0279	2.4 x 10 <sup>4</sup>	4.3802	4.4526	0.0850	0.4633
	2	2.4 x 10 <sup>4</sup>	4.3802			3.6 x 10 <sup>4</sup>	4.5563			
	3	2.8 x 10 <sup>4</sup>	4.4472			2.6 x 10 <sup>4</sup>	4.4150			
	4	2.6 x 10 <sup>4</sup>	4.4150			3.4 x 10 <sup>4</sup>	4.5315			
	5	2.6 x 10 <sup>4</sup>	4.4150			2.4 x 10 <sup>4</sup>	4.3802			
High	1	2.0 x 10 <sup>5</sup>	5.3010	5.2248	0.0787	2.2 x 10 <sup>5</sup>	5.3424	5.2478	0.0895	0.6776
	2	1.6 x 10 <sup>5</sup>	5.2041			1.6 x 10 <sup>5</sup>	5.2041			
	3	2.0 x 10 <sup>5</sup>	5.3010			2.2 x 10 <sup>5</sup>	5.3424			
	4	1.6 x 10 <sup>5</sup>	5.2041			1.4 x 10 <sup>5</sup>	5.1461			
	5	1.3 x 10 <sup>5</sup>	5.1139			1.6 x 10 <sup>5</sup>	5.2041			



**Table 3:** Summary of Results for Sour Cream Matrix Comparison 48 and 60 Hours

Level	Sample	3M™ Petrifilm™ Rapid Yeast and Mold Count Plate				ISO/FDA BAM				p-Value
		Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	
Uninoculated	1	<10	<0	—	—	<10	<0	—	—	N/A
	2	<10	<0			<10	<0			
	3	<10	<0			<10	<0			
	4	<10	<0			<10	<0			
	5	<10	<0			<10	<0			
Low	1	1.0 x 10 <sup>1</sup>	1.0000	1.0602	0.3970	1.0 x 10 <sup>1</sup>	1.0000	1.0000	0.0000	0.3466
	2	1.0 x 10 <sup>1</sup>	1.0000			<10	<1.0000			
	3	1.0 x 10 <sup>1</sup>	1.0000			1.0 x 10 <sup>1</sup>	1.0000			
	4	2.0 x 10 <sup>1</sup>	1.3010			1.0 x 10 <sup>1</sup>	1.0000			
	5	1.0 x 10 <sup>1</sup>	1.0000			1.0 x 10 <sup>1</sup>	1.0000			
Medium	1	1.0 x 10 <sup>2</sup>	2.0000	1.9095	0.0681	7.0 x 10 <sup>1</sup>	1.8451	1.9590	0.0733	0.3007
	2	7.0 x 10 <sup>1</sup>	1.8451			1.0 x 10 <sup>2</sup>	2.0000			
	3	8.0 x 10 <sup>1</sup>	1.9031			9.0 x 10 <sup>1</sup>	1.9542			
	4	9.0 x 10 <sup>1</sup>	1.9542			1.1 x 10 <sup>2</sup>	2.0414			
	5	7.0 x 10 <sup>1</sup>	1.8451			9.0 x 10 <sup>1</sup>	1.9542			
High	1	1.2 x 10 <sup>3</sup>	3.0792	2.9943	0.1050	1.5 x 10 <sup>3</sup>	3.1761	3.1259	0.0367	0.0457
	2	7.5 x 10 <sup>2</sup>	2.8751			1.2 x 10 <sup>3</sup>	3.0792			
	3	1.0 x 10 <sup>3</sup>	3.0000			1.3 x 10 <sup>3</sup>	3.1139			
	4	8.0 x 10 <sup>2</sup>	2.9031			1.4 x 10 <sup>3</sup>	3.1461			
	5	1.3 x 10 <sup>3</sup>	3.1139			1.3 x 10 <sup>3</sup>	3.1139			

**Table 4:** Summary of Results for Almonds Matrix Comparison 48 Hours

Level	Sample	3M™ Petrifilm™ Rapid Yeast and Mold Count Plate				ISO/FDA BAM				p-Value
		Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	
Uninoculated	1	<10	<0	—	—	<10	<0	—	—	N/A
	2	<10	<0			<10	<0			
	3	<10	<0			<10	<0			
	4	<10	<0			<10	<0			
	5	<10	<0			<10	<0			
Low	1	2.0 x 10 <sup>1</sup>	1.3010	1.3362	0.0788	2.0 x 10 <sup>1</sup>	1.3010	1.1556	0.2220	0.1471
	2	2.0 x 10 <sup>1</sup>	1.3010			1.0 x 10 <sup>1</sup>	1.0000			
	3	3.0 x 10 <sup>1</sup>	1.4771			3.0 x 10 <sup>1</sup>	1.4771			
	4	2.0 x 10 <sup>1</sup>	1.3010			1.0 x 10 <sup>1</sup>	1.0000			
	5	2.0 x 10 <sup>1</sup>	1.3010			2.0 x 10 <sup>1</sup>	1.0000			
Medium	1	1.2 x 10 <sup>2</sup>	2.0792	2.2005	0.0984	2.0 x 10 <sup>2</sup>	2.3010	2.3189	0.0590	0.0498
	2	1.4 x 10 <sup>2</sup>	2.1461			2.0 x 10 <sup>2</sup>	2.3010			
	3	2.2 x 10 <sup>2</sup>	2.3424			2.6 x 10 <sup>2</sup>	2.4150			
	4	1.6 x 10 <sup>2</sup>	2.2041			2.1 x 10 <sup>2</sup>	2.3222			
	5	1.7 x 10 <sup>2</sup>	2.2304			1.8 x 10 <sup>2</sup>	2.2553			
High	1	6.2 x 10 <sup>2</sup>	2.7924	2.8106	0.0331	5.0 x 10 <sup>2</sup>	2.6990	2.6903	0.0603	0.0045
	2	6.8 x 10 <sup>2</sup>	2.8325			4.4 x 10 <sup>2</sup>	2.6435			
	3	6.0 x 10 <sup>2</sup>	2.7782			4.3 x 10 <sup>2</sup>	2.6335			
	4	6.2 x 10 <sup>2</sup>	2.7924			4.9 x 10 <sup>2</sup>	2.6902			
	5	7.2 x 10 <sup>2</sup>	2.8573			6.1 x 10 <sup>2</sup>	2.7853			

**Table 5:** Summary of Results for Almonds Matrix Comparison 60 Hours

Level	Sample	3M™ Petrifilm™ Rapid Yeast and Mold Count Plate				ISO/FDA BAM				p-Value
		Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	
Uninoculated	1	<10	<0	—	—	<10	<0	—	—	N/A
	2	<10	<0			<10	<0			
	3	<10	<0			<10	<0			
	4	<10	<0			<10	<0			
	5	<10	<0			<10	<0			
Low	1	2.0 x 10 <sup>1</sup>	1.3010	1.3362	0.0788	2.0 x 10 <sup>1</sup>	1.3010	1.1556	0.2220	0.1471
	2	2.0 x 10 <sup>1</sup>	1.3010			1.0 x 10 <sup>1</sup>	1.0000			
	3	3.0 x 10 <sup>1</sup>	1.4771			3.0 x 10 <sup>1</sup>	1.4771			
	4	2.0 x 10 <sup>1</sup>	1.3010			1.0 x 10 <sup>1</sup>	1.0000			
	5	2.0 x 10 <sup>1</sup>	1.3010			2.0 x 10 <sup>1</sup>	1.0000			
Medium	1	1.4 x 10 <sup>2</sup>	2.0792	2.2177	0.0885	2.0 x 10 <sup>2</sup>	2.3010	2.3189	0.0590	0.0661
	2	1.4 x 10 <sup>2</sup>	2.1461			2.0 x 10 <sup>2</sup>	2.3010			
	3	2.3 x 10 <sup>2</sup>	2.3424			2.6 x 10 <sup>2</sup>	2.4150			
	4	1.6 x 10 <sup>2</sup>	2.2041			2.1 x 10 <sup>2</sup>	2.3222			
	5	1.7 x 10 <sup>2</sup>	2.2304			1.8 x 10 <sup>2</sup>	2.2553			
High	1	6.2 x 10 <sup>2</sup>	2.7924	2.8106	0.0331	5.0 x 10 <sup>2</sup>	2.6990	2.6903	0.0603	0.0045
	2	6.8 x 10 <sup>2</sup>	2.8325			4.4 x 10 <sup>2</sup>	2.6435			
	3	6.0 x 10 <sup>2</sup>	2.7782			4.3 x 10 <sup>2</sup>	2.6335			
	4	6.2 x 10 <sup>2</sup>	2.7924			4.9 x 10 <sup>2</sup>	2.6902			
	5	7.2 x 10 <sup>2</sup>	2.8573			6.1 x 10 <sup>2</sup>	2.7853			

**Table 6:** Summary of Results for Apples Matrix Comparison 48 Hours

Level	Sample	3M™ Petrifilm™ Rapid Yeast and Mold Count Plate				ISO/FDA BAM				p-Value
		Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	
Low	1	4.0 x 10 <sup>1</sup>	1.6021	1.2408	0.2519	4.0 x 10 <sup>1</sup>	1.6021	1.2007	0.3476	0.8546
	2	1.0 x 10 <sup>1</sup>	1.0000			1.0 x 10 <sup>1</sup>	1.0000			
	3	1.0 x 10 <sup>1</sup>	1.0000			1.0 x 10 <sup>1</sup>	1.0000			
	4	2.0 x 10 <sup>1</sup>	1.3010			<10	<0			
	5	2.0 x 10 <sup>1</sup>	1.3010			<10	<0			
Medium	1	3.2 x 10 <sup>2</sup>	2.5051	2.2208	0.1769	4.6 x 10 <sup>2</sup>	2.6628	2.1752	0.2839	0.8583
	2	1.2 x 10 <sup>2</sup>	2.0792			1.1 x 10 <sup>2</sup>	2.0414			
	3	1.4 x 10 <sup>2</sup>	2.1461			1.1 x 10 <sup>2</sup>	2.0414			
	4	1.2 x 10 <sup>2</sup>	2.0792			9.0 x 10 <sup>1</sup>	1.9542			
	5	1.6 x 10 <sup>2</sup>	2.2041			1.5 x 10 <sup>2</sup>	2.1761			
High	1	1.8 x 10 <sup>4</sup>	4.2553	4.2837	0.1187	3.0 x 10 <sup>4</sup>	4.4771	4.4407	0.1555	0.1104
	2	1.6 x 10 <sup>4</sup>	4.2041			1.9 x 10 <sup>4</sup>	4.2788			
	3	2.5 x 10 <sup>4</sup>	4.3979			3.6 x 10 <sup>4</sup>	4.5563			
	4	2.6 x 10 <sup>4</sup>	4.4150			4.1 x 10 <sup>4</sup>	4.6128			
	5	1.4 x 10 <sup>4</sup>	4.1461			1.9 x 10 <sup>4</sup>	4.2788			

**Table 7:** Summary of Results for Apples Matrix Comparison 60 Hours

Level	Sample	3M™ Petrifilm™ Rapid Yeast and Mold Count Plate				ISO/FDA BAM				p-Value
		Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	
Low	1	4.0 x 10 <sup>1</sup>	1.6021	1.2408	0.2519	4.0 x 10 <sup>1</sup>	1.6021	1.2007	0.3476	0.8546
	2	1.0 x 10 <sup>1</sup>	1.0000			1.0 x 10 <sup>1</sup>	1.0000			
	3	1.0 x 10 <sup>1</sup>	1.0000			1.0 x 10 <sup>1</sup>	1.0000			
	4	2.0 x 10 <sup>1</sup>	1.3010			<10	<0			
	5	2.0 x 10 <sup>1</sup>	1.3010			<10	<0			
Medium	1	3.2 x 10 <sup>2</sup>	2.5051	2.2632	0.1580	4.6 x 10 <sup>2</sup>	2.6628	2.1752	0.2839	0.5615
	2	1.5 x 10 <sup>2</sup>	2.1761			1.1 x 10 <sup>2</sup>	2.0414			
	3	1.4 x 10 <sup>2</sup>	2.1461			1.1 x 10 <sup>2</sup>	2.0414			
	4	1.4 x 10 <sup>2</sup>	2.1461			9.0 x 10 <sup>1</sup>	1.9542			
	5	2.2 x 10 <sup>2</sup>	2.3424			1.5 x 10 <sup>2</sup>	2.1761			
High	1	1.8 x 10 <sup>4</sup>	4.2553	4.2837	0.1187	3.0 x 10 <sup>4</sup>	4.4771	4.4407	0.1555	0.1104
	2	1.6 x 10 <sup>4</sup>	4.2041			1.9 x 10 <sup>4</sup>	4.2788			
	3	2.5 x 10 <sup>4</sup>	4.3979			3.6 x 10 <sup>4</sup>	4.5563			
	4	2.6 x 10 <sup>4</sup>	4.4150			4.1 x 10 <sup>4</sup>	4.6128			
	5	1.4 x 10 <sup>4</sup>	4.1461			1.9 x 10 <sup>4</sup>	4.2788			

**Table 8:** Summary of Results for Frozen Bread Dough Matrix Comparison 48 Hours

Level	Sample	3M™ Petrifilm™ Rapid Yeast and Mold Count Plate				ISO/FDA BAM				p-Value
		Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	
Low	1	2.2 x 10 <sup>2</sup>	2.3424	2.3530	0.1116	2.1 x 10 <sup>2</sup>	2.3222	2.3580	0.0873	0.9389
	2	1.8 x 10 <sup>2</sup>	2.2553			2.1 x 10 <sup>2</sup>	2.3222			
	3	2.1 x 10 <sup>2</sup>	2.3222			1.9 x 10 <sup>2</sup>	2.2788			
	4	2.0 x 10 <sup>2</sup>	2.3010			2.3 x 10 <sup>2</sup>	2.3617			
	5	3.5 x 10 <sup>2</sup>	2.5441			3.2 x 10 <sup>2</sup>	2.5051			
Medium	1	2.8 x 10 <sup>3</sup>	3.4472	3.4308	0.0628	2.0 x 10 <sup>3</sup>	3.3010	3.3045	0.2073	0.2490
	2	2.4 x 10 <sup>3</sup>	3.3802			2.3 x 10 <sup>3</sup>	3.3617			
	3	2.6 x 10 <sup>3</sup>	3.4150			2.2 x 10 <sup>3</sup>	3.3424			
	4	2.4 x 10 <sup>3</sup>	3.3802			9.4 x 10 <sup>2</sup>	2.9731			
	5	3.4 x 10 <sup>3</sup>	3.5315			3.5 x 10 <sup>3</sup>	3.5441			
High	1	2.5 x 10 <sup>4</sup>	4.3979	4.3748	0.1136	1.8 x 10 <sup>4</sup>	4.2553	3.9650	0.1690	0.0020
	2	2.2 x 10 <sup>4</sup>	4.3424			8.0 x 10 <sup>3</sup>	3.9031			
	3	2.1 x 10 <sup>4</sup>	4.3222			8.6 x 10 <sup>3</sup>	3.9345			
	4	1.8 x 10 <sup>4</sup>	4.2553			6.5 x 10 <sup>3</sup>	3.8129			
	5	3.6 x 10 <sup>4</sup>	4.5563			8.3 x 10 <sup>3</sup>	3.9191			

**Table 9:** Summary of Results for Frozen Bread Dough Matrix Comparison 60 Hours

Level	Sample	3M™ Petrifilm™ Rapid Yeast and Mold Count Plate				ISO/FDA BAM				p-Value
		Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	
Low	1	2.2 x 10 <sup>2</sup>	2.3424	2.3836	0.1054	2.1 x 10 <sup>2</sup>	2.3222	2.3580	0.0873	0.6873
	2	1.9 x 10 <sup>2</sup>	2.2788			2.1 x 10 <sup>2</sup>	2.3222			
	3	2.5 x 10 <sup>2</sup>	2.3979			1.9 x 10 <sup>2</sup>	2.2788			
	4	2.2 x 10 <sup>2</sup>	2.3424			2.3 x 10 <sup>2</sup>	2.3617			
	5	3.6 x 10 <sup>2</sup>	2.5563			3.2 x 10 <sup>2</sup>	2.5051			
Medium	1	2.9 x 10 <sup>3</sup>	3.4624	3.4374	0.0608	2.0 x 10 <sup>3</sup>	3.3010	3.3045	0.2073	0.2274
	2	2.5 x 10 <sup>3</sup>	3.3979			2.3 x 10 <sup>3</sup>	3.3617			
	3	2.6 x 10 <sup>3</sup>	3.4150			2.2 x 10 <sup>3</sup>	3.3424			
	4	2.4 x 10 <sup>3</sup>	3.3802			9.4 x 10 <sup>2</sup>	2.9731			
	5	3.4 x 10 <sup>3</sup>	3.5315			3.5 x 10 <sup>3</sup>	3.5441			
High	1	2.6 x 10 <sup>4</sup>	4.4150	4.3987	0.1154	1.8 x 10 <sup>4</sup>	4.2553	3.9650	0.1690	0.0015
	2	2.5 x 10 <sup>4</sup>	4.3979			8.0 x 10 <sup>3</sup>	3.9031			
	3	2.1 x 10 <sup>4</sup>	4.3222			8.6 x 10 <sup>3</sup>	3.9345			
	4	1.9 x 10 <sup>4</sup>	4.2788			6.5 x 10 <sup>3</sup>	3.8129			
	5	3.8 x 10 <sup>4</sup>	4.5798			8.3 x 10 <sup>3</sup>	3.9191			

**Table 10:** Summary of Results for Ready Made Pie Matrix Comparison 48 Hours

Level	Sample	3M™ Petrifilm™ Rapid Yeast and Mold Count Plate				ISO/FDA BAM				p-Value
		Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	
Uninoculated	1	<10	<0	—	—	<10	<0	—	—	N/A
	2	<10	<0			<10	<0			
	3	<10	<0			<10	<0			
	4	<10	<0			<10	<0			
	5	<10	<0			<10	<0			
Low	1	2.0 x 10 <sup>1</sup>	1.3010	1.1204	0.1649	1.0 x 10 <sup>1</sup>	1.0000	1.2007	0.1738	0.5370
	2	1.0 x 10 <sup>1</sup>	1.0000			2.0 x 10 <sup>1</sup>	1.3010			
	3	1.0 x 10 <sup>1</sup>	1.0000			2.0 x 10 <sup>1</sup>	1.3010			
	4	1.0 x 10 <sup>1</sup>	1.0000			<10	<0			
	5	2.0 x 10 <sup>1</sup>	1.3010			<10	<0			
Medium	1	1.2 x 10 <sup>2</sup>	2.0792	2.1563	0.1381	1.0 x 10 <sup>2</sup>	2.0000	2.1244	0.1482	0.7334
	2	1.4 x 10 <sup>2</sup>	2.1461			1.4 x 10 <sup>2</sup>	2.1461			
	3	1.2 x 10 <sup>2</sup>	2.0792			1.3 x 10 <sup>2</sup>	2.1139			
	4	1.2 x 10 <sup>2</sup>	2.0792			1.0 x 10 <sup>2</sup>	2.0000			
	5	2.5 x 10 <sup>2</sup>	2.3979			2.3 x 10 <sup>2</sup>	2.3617			
High	1	7.2 x 10 <sup>3</sup>	3.8573	3.8944	0.0324	5.0 x 10 <sup>3</sup>	3.6990	3.7339	0.0433	0.0001
	2	7.7 x 10 <sup>3</sup>	3.8865			6.2 x 10 <sup>3</sup>	3.7924			
	3	8.0 x 10 <sup>3</sup>	3.9031			5.8 x 10 <sup>3</sup>	3.7634			
	4	7.6 x 10 <sup>3</sup>	3.8808			4.9 x 10 <sup>3</sup>	3.6902			
	5	8.8 x 10 <sup>3</sup>	3.9445			5.3 x 10 <sup>3</sup>	3.7243			

**Table 11:** Summary of Results for Ready Made Pie Matrix Comparison 60 Hours

Level	Sample	3M™ Petrifilm™ Rapid Yeast and Mold Count Plate				ISO/FDA BAM				p-Value
		Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	
Uninoculated	1	<10	<0	—	—	<10	<0	—	—	N/A
	2	<10	<0			<10	<0			
	3	<10	<0			<10	<0			
	4	<10	<0			<10	<0			
	5	<10	<0			<10	<0			
Low	1	2.0 x 10 <sup>1</sup>	1.3010	1.1204	0.1649	1.0 x 10 <sup>1</sup>	1.0000	1.2007	0.1738	0.5370
	2	1.0 x 10 <sup>1</sup>	1.0000			2.0 x 10 <sup>1</sup>	1.3010			
	3	1.0 x 10 <sup>1</sup>	1.0000			2.0 x 10 <sup>1</sup>	1.3010			
	4	1.0 x 10 <sup>1</sup>	1.0000			<10	<0			
	5	2.0 x 10 <sup>1</sup>	1.3010			<10	<0			
Medium	1	1.3 x 10 <sup>2</sup>	2.1139	2.1633	0.1341	1.0 x 10 <sup>2</sup>	2.0000	2.1244	0.1482	0.6748
	2	1.4 x 10 <sup>2</sup>	2.1461			1.4 x 10 <sup>2</sup>	2.1461			
	3	1.2 x 10 <sup>2</sup>	2.0792			1.3 x 10 <sup>2</sup>	2.1139			
	4	1.2 x 10 <sup>2</sup>	2.0792			1.0 x 10 <sup>2</sup>	2.0000			
	5	2.5 x 10 <sup>2</sup>	2.3979			2.3 x 10 <sup>2</sup>	2.3617			
High	1	7.4 x 10 <sup>3</sup>	3.8692	3.8991	0.0282	5.0 x 10 <sup>3</sup>	3.6990	3.7339	0.0433	0.0001
	2	7.8 x 10 <sup>3</sup>	3.8921			6.2 x 10 <sup>3</sup>	3.7924			
	3	8.0 x 10 <sup>3</sup>	3.9031			5.8 x 10 <sup>3</sup>	3.7634			
	4	7.7 x 10 <sup>3</sup>	3.8865			4.9 x 10 <sup>3</sup>	3.6902			
	5	8.8 x 10 <sup>3</sup>	3.9445			5.3 x 10 <sup>3</sup>	3.7243			

**Table 12:** Summary of Results for Sandwiches Matrix Comparison 48 Hours

Level	Sample	3M™ Petrifilm™ Rapid Yeast and Mold Count Plate				ISO/FDA BAM				p-Value
		Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	
Low	1	2.0 x 10 <sup>1</sup>	1.3010	1.4214	0.2692	4.0 x 10 <sup>1</sup>	1.6021	1.3362	0.2270	0.6033
	2	4.0 x 10 <sup>1</sup>	1.6021			3.0 x 10 <sup>1</sup>	1.4771			
	3	4.0 x 10 <sup>1</sup>	1.6021			2.0 x 10 <sup>1</sup>	1.3010			
	4	4.0 x 10 <sup>1</sup>	1.6021			2.0 x 10 <sup>1</sup>	1.3010			
	5	1.0 x 10 <sup>1</sup>	1.0000			1.0 x 10 <sup>1</sup>	1.0000			
Medium	1	3.6 x 10 <sup>2</sup>	2.5563	2.4085	0.1371	2.7 x 10 <sup>2</sup>	2.4314	2.4414	0.0522	0.6367
	2	3.2 x 10 <sup>2</sup>	2.5051			2.7 x 10 <sup>2</sup>	2.4314			
	3	1.6 x 10 <sup>2</sup>	2.2041			2.5 x 10 <sup>2</sup>	2.3979			
	4	2.6 x 10 <sup>2</sup>	2.4150			2.6 x 10 <sup>2</sup>	2.4150			
	5	2.3 x 10 <sup>2</sup>	2.3617			3.4 x 10 <sup>2</sup>	2.5315			
High	1	1.0 x 10 <sup>4</sup>	4.0000	3.9973	0.0451	1.1 x 10 <sup>4</sup>	4.0414	4.2021	0.1363	0.0242
	2	1.1 x 10 <sup>4</sup>	4.0414			1.4 x 10 <sup>4</sup>	4.1461			
	3	9.1 x 10 <sup>3</sup>	3.9590			2.6 x 10 <sup>4</sup>	4.4150			
	4	1.1 x 10 <sup>4</sup>	4.0414			1.6 x 10 <sup>4</sup>	4.2041			
	5	8.8 x 10 <sup>3</sup>	3.9445			1.6 x 10 <sup>4</sup>	4.2041			

**Table 13:** Summary of Results for Sandwiches Matrix Comparison 60 Hours

Level	Sample	3M™ Petrifilm™ Rapid Yeast and Mold Count Plate				ISO/FDA BAM				p-Value
		Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	
Low	1	2.0 x 10 <sup>1</sup>	1.3010	1.4214	0.2692	4.0 x 10 <sup>1</sup>	1.6021	1.3362	0.2270	0.6033
	2	4.0 x 10 <sup>1</sup>	1.6021			3.0 x 10 <sup>1</sup>	1.4771			
	3	4.0 x 10 <sup>1</sup>	1.6021			2.0 x 10 <sup>1</sup>	1.3010			
	4	4.0 x 10 <sup>1</sup>	1.6021			2.0 x 10 <sup>1</sup>	1.3010			
	5	1.0 x 10 <sup>1</sup>	1.0000			1.0 x 10 <sup>1</sup>	1.0000			
Medium	1	3.6 x 10 <sup>2</sup>	2.5563	2.4137	0.1275	2.7 x 10 <sup>2</sup>	2.4314	2.4414	0.0522	0.6648
	2	3.2 x 10 <sup>2</sup>	2.5051			2.7 x 10 <sup>2</sup>	2.4314			
	3	1.7 x 10 <sup>2</sup>	2.2304			2.5 x 10 <sup>2</sup>	2.3979			
	4	2.6 x 10 <sup>2</sup>	2.4150			2.6 x 10 <sup>2</sup>	2.4150			
	5	2.3 x 10 <sup>2</sup>	2.3617			3.4 x 10 <sup>2</sup>	2.5315			
High	1	1.1 x 10 <sup>4</sup>	4.0414	4.0131	0.0396	1.1 x 10 <sup>4</sup>	4.0414	4.2021	0.1363	0.0308
	2	1.1 x 10 <sup>4</sup>	4.0414			1.4 x 10 <sup>4</sup>	4.1461			
	3	9.6 x 10 <sup>3</sup>	3.9823			2.6 x 10 <sup>4</sup>	4.4150			
	4	1.1 x 10 <sup>4</sup>	4.0414			1.6 x 10 <sup>4</sup>	4.2041			
	5	9.1 x 10 <sup>3</sup>	3.9590			1.6 x 10 <sup>4</sup>	4.2041			

**Table 14:** Summary of Results for Dehydrated Soup Matrix Comparison 48 and 60 Hours

Level	Sample	3M™ Petrifilm™ Rapid Yeast and Mold Count Plate				ISO/FDA BAM				p-Value
		Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	
Low	1	2.0 x 10 <sup>1</sup>	1.3010	1.2760	0.1721	<10	<0	—	—	N/A
	2	3.0 x 10 <sup>1</sup>	1.4771			<10	<0			
	3	1.0 x 10 <sup>1</sup>	1.0000			<10	<0			
	4	2.0 x 10 <sup>1</sup>	1.3010			<10	<0			
	5	2.0 x 10 <sup>1</sup>	1.3010			<10	<0			
Medium	1	3.1 x 10 <sup>2</sup>	2.4914	2.4234	0.1132	<10	<0	—	—	N/A
	2	3.4 x 10 <sup>2</sup>	2.5315			<10	<0			
	3	2.3 x 10 <sup>2</sup>	2.3617			<10	<0			
	4	3.0 x 10 <sup>2</sup>	2.4771			<10	<0			
	5	1.8 x 10 <sup>2</sup>	2.2553			<10	<0			
High	1	1.3 x 10 <sup>3</sup>	3.1139	2.9145	0.1366	<10	<0	—	—	N/A
	2	7.2 x 10 <sup>2</sup>	2.8573			<10	<0			
	3	9.9 x 10 <sup>2</sup>	2.9956			<10	<0			
	4	6.4 x 10 <sup>2</sup>	2.8062			<10	<0			
	5	6.3 x 10 <sup>2</sup>	2.7993			<10	<0			

**Table 15:** Summary of Results for Sausage Matrix Comparison 48 Hours

Level	Sample	3M™ Petrifilm™ Rapid Yeast and Mold Count Plate				ISO/FDA BAM				p-Value
		Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	
Uninoculated	1	<10	<0	—	—	<10	<0	—	—	N/A
	2	<10	<0			<10	<0			
	3	<10	<0			<10	<0			
	4	<10	<0			<10	<0			
	5	<10	<0			<10	<0			
Low	1	<10	<0	1.3637	0.4671	<10	<0	1.4758	0.4273	0.7354
	2	9.5 x 10 <sup>1</sup>	1.9777			1.0 x 10 <sup>2</sup>	2.0000			
	3	1.0 x 10 <sup>1</sup>	1.0000			2.0 x 10 <sup>1</sup>	1.3010			
	4	1.0 x 10 <sup>1</sup>	1.0000			1.0 x 10 <sup>1</sup>	1.0000			
	5	3.0 x 10 <sup>1</sup>	1.4771			4.0 x 10 <sup>1</sup>	1.6021			
Medium	1	3.2 x 10 <sup>2</sup>	2.5051	2.5042	0.0843	3.4 x 10 <sup>2</sup>	2.5315	2.4942	0.0554	0.8313
	2	3.6 x 10 <sup>2</sup>	2.5563			3.4 x 10 <sup>2</sup>	2.5315			
	3	4.0 x 10 <sup>2</sup>	2.6021			3.2 x 10 <sup>2</sup>	2.5051			
	4	3.0 x 10 <sup>2</sup>	2.4771			2.5 x 10 <sup>2</sup>	2.3979			
	5	2.4 x 10 <sup>2</sup>	2.3802			3.2 x 10 <sup>2</sup>	2.5051			
High	1	2.5 x 10 <sup>3</sup>	3.3979	3.4035	0.0385	2.0 x 10 <sup>3</sup>	3.3010	3.3568	0.0352	0.0805
	2	2.6 x 10 <sup>3</sup>	3.4150			2.4 x 10 <sup>3</sup>	3.3802			
	3	2.6 x 10 <sup>3</sup>	3.4150			2.4 x 10 <sup>3</sup>	3.3802			
	4	2.2 x 10 <sup>3</sup>	3.3424			2.2 x 10 <sup>3</sup>	3.3424			
	5	2.8 x 10 <sup>3</sup>	3.4472			2.4 x 10 <sup>3</sup>	3.3802			

**Table 16:** Summary of Results for Sausage Matrix Comparison 60 Hours

Level	Sample	3M™ Petrifilm™ Rapid Yeast and Mold Count Plate				ISO/FDA BAM				p-Value
		Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	
Uninoculated	1	<10	<0	—	—	<10	<0	—	—	N/A
	2	<10	<0			<10	<0			
	3	<10	<0			<10	<0			
	4	<10	<0			<10	<0			
	5	<10	<0			<10	<0			
Low	1	<10	<0	1.4109	0.5072	<10	<0	1.4758	0.4273	0.1461
	2	1.1 x 10 <sup>2</sup>	2.0414			1.0 x 10 <sup>2</sup>	2.0000			
	3	1.0 x 10 <sup>1</sup>	1.0000			2.0 x 10 <sup>1</sup>	1.3010			
	4	1.0 x 10 <sup>1</sup>	1.0000			1.0 x 10 <sup>1</sup>	1.0000			
	5	4.0 x 10 <sup>1</sup>	1.6021			4.0 x 10 <sup>1</sup>	1.6021			
Medium	1	3.2 x 10 <sup>2</sup>	2.5051	2.5089	0.0686	3.4 x 10 <sup>2</sup>	2.5315	2.4942	0.0554	0.7194
	2	3.6 x 10 <sup>2</sup>	2.5563			3.4 x 10 <sup>2</sup>	2.5315			
	3	3.9 x 10 <sup>2</sup>	2.5911			3.2 x 10 <sup>2</sup>	2.5051			
	4	3.0 x 10 <sup>2</sup>	2.4771			2.5 x 10 <sup>2</sup>	2.3979			
	5	2.6 x 10 <sup>2</sup>	2.4150			3.2 x 10 <sup>2</sup>	2.5051			
High	1	2.5 x 10 <sup>3</sup>	3.3979	3.4095	0.0481	2.0 x 10 <sup>3</sup>	3.3010	3.3568	0.0352	0.0837
	2	2.6 x 10 <sup>3</sup>	3.4150			2.4 x 10 <sup>3</sup>	3.3802			
	3	2.6 x 10 <sup>3</sup>	3.4150			2.4 x 10 <sup>3</sup>	3.3802			
	4	2.2 x 10 <sup>3</sup>	3.3424			2.2 x 10 <sup>3</sup>	3.3424			
	5	3.0 x 10 <sup>3</sup>	3.4771			2.4 x 10 <sup>3</sup>	3.3802			

**Table 17: Summary of Results for Ground Beef Matrix Comparison 48 Hours**

Level	Sample	3M™ Petrifilm™ Rapid Yeast and Mold Count Plate				ISO/FDA BAM				p-Value
		Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	
Uninoculated	1	<10	<0	—	—	<10	<0	—	—	N/A
	2	<10	<0			<10	<0			
	3	<10	<0			<10	<0			
	4	<10	<0			<10	<0			
	5	<10	<0			<10	<0			
Low	1	4.0 x 10 <sup>1</sup>	1.6021	1.6373	0.2270	6.0 x 10 <sup>1</sup>	1.7782	1.8975	0.1922	0.0861
	2	2.0 x 10 <sup>1</sup>	1.3010			8.0 x 10 <sup>1</sup>	1.9031			
	3	4.0 x 10 <sup>1</sup>	1.6021			8.0 x 10 <sup>1</sup>	1.9031			
	4	6.0 x 10 <sup>1</sup>	1.7782			5.0 x 10 <sup>1</sup>	1.6990			
	5	8.0 x 10 <sup>1</sup>	1.9031			1.6 x 10 <sup>2</sup>	2.2041			
Medium	1	1.9 x 10 <sup>2</sup>	2.2788	2.3468	0.1215	2.2 x 10 <sup>2</sup>	2.3424	2.3722	0.1390	0.7657
	2	2.2 x 10 <sup>2</sup>	2.3424			2.3 x 10 <sup>2</sup>	2.3617			
	3	2.0 x 10 <sup>2</sup>	2.3010			1.6 x 10 <sup>2</sup>	2.2041			
	4	1.8 x 10 <sup>2</sup>	2.2553			3.9 x 10 <sup>2</sup>	2.5911			
	5	3.6 x 10 <sup>2</sup>	2.5563			2.3 x 10 <sup>2</sup>	2.3617			
High	1	5.0 x 10 <sup>3</sup>	3.6990	3.6877	0.0276	3.5 x 10 <sup>3</sup>	3.5441	3.6288	0.0538	0.0613
	2	4.4 x 10 <sup>3</sup>	3.6435			4.3 x 10 <sup>3</sup>	3.6335			
	3	5.2 x 10 <sup>3</sup>	3.7160			4.9 x 10 <sup>3</sup>	3.6902			
	4	5.0 x 10 <sup>3</sup>	3.6990			4.5 x 10 <sup>3</sup>	3.6532			
	5	4.8 x 10 <sup>3</sup>	3.6812			4.2 x 10 <sup>3</sup>	3.6232			

**Table 18: Summary of Results for Ground Beef Matrix Comparison 60 Hours**

Level	Sample	3M™ Petrifilm™ Rapid Yeast and Mold Count Plate				ISO/FDA BAM				p-Value
		Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	Ct/g	LOG	MEAN	SD (S <sub>r</sub> )	
Uninoculated	1	<10	<0	—	—	<10	<0	—	—	N/A
	2	<10	<0			<10	<0			
	3	<10	<0			<10	<0			
	4	<10	<0			<10	<0			
	5	<10	<0			<10	<0			
Low	1	4.0 x 10 <sup>1</sup>	1.6021	1.6725	0.1677	6.0 x 10 <sup>1</sup>	1.7782	1.8975	0.1922	0.0840
	2	3.0 x 10 <sup>1</sup>	1.4771			8.0 x 10 <sup>1</sup>	1.9031			
	3	4.0 x 10 <sup>1</sup>	1.6021			8.0 x 10 <sup>1</sup>	1.9031			
	4	6.0 x 10 <sup>1</sup>	1.7782			5.0 x 10 <sup>1</sup>	1.6990			
	5	8.0 x 10 <sup>1</sup>	1.9031			1.6 x 10 <sup>2</sup>	2.2041			
Medium	1	2.0 x 10 <sup>2</sup>	2.3010	2.3651	0.1214	2.2 x 10 <sup>2</sup>	2.3424	2.3722	0.1390	0.9330
	2	2.2 x 10 <sup>2</sup>	2.3424			2.3 x 10 <sup>2</sup>	2.3617			
	3	2.0 x 10 <sup>2</sup>	2.3010			1.6 x 10 <sup>2</sup>	2.2041			
	4	2.0 x 10 <sup>2</sup>	2.3010			3.9 x 10 <sup>2</sup>	2.5911			
	5	3.8 x 10 <sup>2</sup>	2.5798			2.3 x 10 <sup>2</sup>	2.3617			
High	1	5.0 x 10 <sup>3</sup>	3.6990	3.6877	0.0276	3.5 x 10 <sup>3</sup>	3.5441	3.6288	0.0538	0.0613
	2	4.4 x 10 <sup>3</sup>	3.6435			4.3 x 10 <sup>3</sup>	3.6335			
	3	5.2 x 10 <sup>3</sup>	3.7160			4.9 x 10 <sup>3</sup>	3.6902			
	4	5.0 x 10 <sup>3</sup>	3.6990			4.5 x 10 <sup>3</sup>	3.6532			
	5	4.8 x 10 <sup>3</sup>	3.6812			4.2 x 10 <sup>3</sup>	3.6232			



**3M Food Safety**

3M Center  
Building 275-5W-05  
St. Paul, MN 55144-1000  
USA  
1-800-328-6553  
[www.3M.com/foodsafety](http://www.3M.com/foodsafety)

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