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File No. 41741-005

Corrugated Packaging Alliance
500 Park Blvd., Suite 985
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Attention: Mr. Dennis Colley

Subject: Evaluation of RPC surface cleanliness using rapid Adenosine Triphosphate (ATP) bioluminescence

Dear Mr. Colley:

Fresh produce has been documented by the United States (US) Center for Disease Control and Prevention (CDC) as a leading source of food-borne illness (CDC, 2014). With the recent passage of the US Food Safety Modernization Act (FSMA), the supply chain has become an even greater source of regulatory scrutiny for growers, shippers and even retailers. FSMA now requires US entities take a proactive rather than reactive approach to food safety (US FDA, undated).

Although food-borne illness has not been directly associated with shipping and transport containers, the potential for containers to harbor and transfer microbial loads to the fresh produce placed in those containers has been documented (Danyluk, 2010; Sanders, 2015a; Suslow, 2014; Warriner, 2013 & 2014). To address this, and meet the intent of FSMA, a follow up assessment of the cleanliness of reusable plastic containers (RPCs) was deemed critical as previous field studies indicated a large percentage of containers showed visible contamination and/or microbial contamination that could affect the produce placed within them.

Previous studies that assessed container cleanliness, both in the US and Canada, using standard microbial methods, which identify the viable number of organism on a contact surface, have shown that a large percentage (up to 50%) of RPCs failed acceptable microbial limits (Sanders, 2015b; Suslow, 2014; Warriner 2013 and 2014). Although these standard methods have been the "gold standard" for assessing cleanliness of food contact surfaces, grower/shippers and their downstream users are looking for a rapid method to assess container cleanliness.

This report summarizes results of recent field tests performed on RPCs where a rapid method for assessing the cleanliness of the RPCs was employed. This rapid technique measures the adenosine triphosphate (ATP) level on the container surface using a rapid bioluminescent technique with results provided in relative light units (RLUs). Rapid ATP measurement has been marketed to businesses in the food supply chain to provide a means for rapidly determine container cleanliness based the presence of ATP, which suggests the presence of an organic (biological) material, which may include residual plant or animal material, bacteria or mold. Although ATP may arise from various sources, the presence of ATP (reported as RLU) has been loosely associated with microbial contamination (Cunningham et. al., 2011).

Hygiena (an ATP instrument manufacturer) offers these general guidelines for RLU thresholds based on the surface type.[1] These limits were based on standard microbial count and ATP correlation studies.

Table 1: Hygiena RLU Thresholds

RLU Thresholds	Acceptable RLU Value	Cautionary RLU Value	Failing RLU Value
Easy to Clean	≤10	11-19	≥20
Difficult to Clean	≤10	11-29	≥30

Project Methodology

RPCs at three different grower/shipper locations across multiple geographical regions were sampled and tested using a protocol based on a previous field study of RPC cleanliness, but also incorporating ATP testing (Suslow, 2014). It was reviewed and approved by Dr. Suslow prior to study initiation.

The protocol included the visible evaluation of available RPCs for signs of inadequate cleaning, sanitization or drying, a standard microbial evaluation for the presence of two indicator organisms, *Enterobacteriaceae* and thermotolerant coliforms, and an evaluation of RPC cleanliness using rapid ATP measurements. Two different container subsets were evaluated at each location: (1) visibly clean RPCs (random RPCs) and (2) RPCs with visible clues indicating a potential lack of cleanliness (i.e., residual liquid, old product stickers, residual plant material), classified as "for cause" RPCs. A total of 24 random RPCs and 12 "for cause" RPCs were sampled at each of the three locations.[2]

RPCs were chosen from various locations (top, middle and bottom) within each pallet. The entire interior surface of the containers was evaluated using two distinct sponge samples; one of the interior bottom and one of the inside sides and hinges. In addition, areas of visible contamination on the interiors of "for cause" RPCs were also to be sampled.

Testing was performed at three separate grower/shipper locations: two California locations (Santa Maria and Temecula) and one location in the Pacific Northwest (Delta, British Columbia, Canada). Sampling and laboratory analysis were performed by Primus Laboratories of Santa Maria, CA.

[1] Different surfaces have different levels of risk, and therefore may require different thresholds. Porous plastic or rubber surfaces may be more difficult to clean, and therefore produce higher results. Based on descriptions from IFCO, RPCs were deemed as easy to clean.

[2] Due to a sampling error by the laboratory, ATP measurements were not taken on "for cause" RPCs at either the California Location 1 or at the British Columbia location.

Results

VISIBLE OBSERVATIONS

RPCs from pallets wrapped in a green protective wrap were selected for evaluation at each site. IFCO literature indicates that the containers on green wrapped pallets are clean, sanitized, and dry (IFCO, undated).

Image 1: Depiction of IFCO green wrapped RPC pallets

The RPCS were inspected for the presence of visible clues indicating the containers may have not undergone sufficient cleaning, sanitizing, or drying. RPCs that appeared visibly clean and dry were classified as random RPCs, while RPCs with visible moisture, residual plant material or stickers were classified as "for cause". Representative photographs taken at the sampling sites of RPCs assessed as "for cause" are presented as Images 2-6.

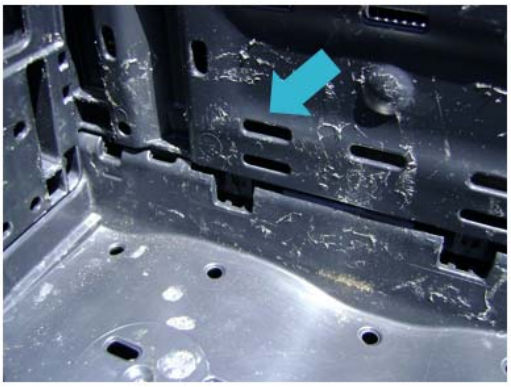


Image 2: Santa Maria, CA - Sample USM16-072088-01B (residual adhesives and other unspecified residual)

Image 3: Temecula, CA UMS16.102272-01A (residual label and free moisture)

Image 4: Temecula, CA UMS16.102272-07C (unknown contamination)

Image 5: Delta, BC Sample USM 104492-01D (residual label and adhesive)

Image 6: Delta, BC Sample USM 104492-04C (residual plant material)

STANDARD MICROBIAL TEST VERSUS ATP LEVELS

The number of viable *Enterobacteriacea*e and thermotolerant coliforms on the interior surfaces of the containers was determined. Over 93 percent of random (visibly clean) RPCs displayed microbial counts below the acceptable limit of 1,000 colony forming units (CFU) with five random RPCs having microbial loads above 1,000 CFU/container. The maximum microbial load identified was 14,300 CFU/container. All "for cause" RPCs displayed microbial counts below acceptable limits.[3] The microbial loads on containers exceeding acceptable limits were primarily or completely composed of *Enterobacteriaceae*, rather than thermotolerant coliforms.

As the presence ATP (determined using rapid bioluminescence and recorded as RLU) has been loosely correlated with potential microbial contamination, the results of the standard microbial counts for *Enterobacteriaceae* and thermotolerant coliforms on the interior RPC surface were correlated to the measured RLU values. These results are summarized in Table 4.[4]

Table 4: RLU values based on identified microbial loads on RPCs[5]

Sample	<10 CFU	>10 - ≤100 CFU	>100 - ≤1,000 CFU	>1,000 - ≤10,000 CFU	>10,000 - ≤100,000 CFU
All Random RPCs	0-155	0-62	1-155	3-101	10
California-2: "for cause" RPCs	0-429	0-176	9-77	N/A*	N/A*

* N/A = Not Applicable

Although some RPCs with microbial counts below 10 CFU (well below the acceptable limit of 1000 CFU) had RLU value of zero (Acceptable) many did not show good correlation. To exemplify this poor correlation, it is noted that:

- The RPC with the largest number of organisms (14,300 CFU) (above acceptable limits) had a RLU value of ten (Acceptable).
- The highest RLU value (429: Failing) was from a RPC with <10 CFU present on the RPC surface.
- Note: This elevated RLU level identified may have resulted from microorganisms not evaluated in this study or another unidentified organic source.

[3] Acceptable limits for both *Enterobacteriaceae* and thermotolerant coliforms were set as 1000 CFU/container levels specified by Dr. Keith Warriner at the University of Guelph (Warriner, 2013)

[4] Due to a sampling error by the laboratory, ATP measurements were not taken on "for cause" RPCs at either the California Location 1 or at the British Columbia location.

[5] The determination of RLU values on "for cause" RPCs was not performed at the California-1 site or the British Columbia site due to sampling errors.

The percentage of RPCs falling within each of the ATP instrument manufacturer's defined categories (i.e., Acceptable, Cautionary or Failing) are presented in the following pie charts. As expected the percentage of RPCs with failing RLU values was higher in the "for cause" sample set, possibly due to the visible contamination observed.

Chart 1: Percentage of Random RPCs with Acceptable, Cautionary or Failing RLU levels (N=72)

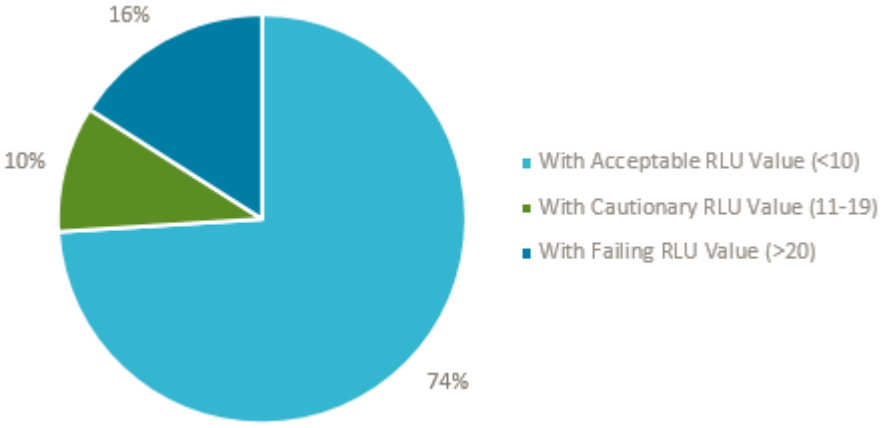
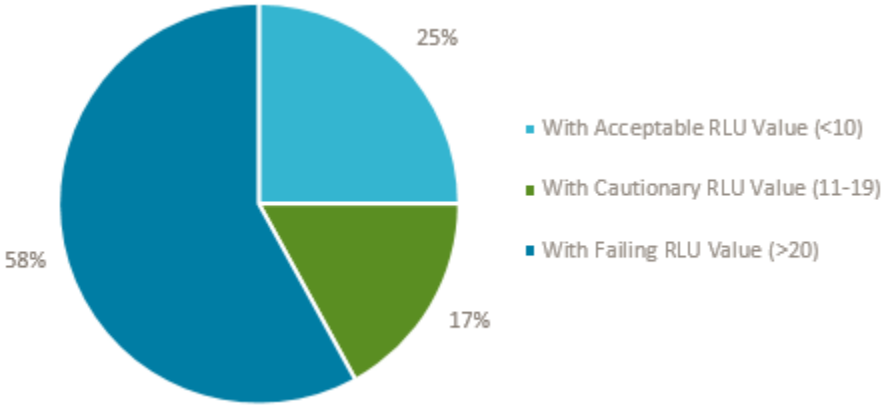


Chart 2: Percentage of "for cause" RPCs with Acceptable, Cautionary or Failing RLU levels (N=12)



Conclusion

RPCs at three grower/shipper locations across the US and Canada were evaluated visibly, by standard microbial methods for the presence of *Enterobacteriaceae* and thermotolerant coliforms, and using a rapid ATP bioluminescence test to assess the cleanliness of RPCs currently being used by the fresh produce industry.

The visible inspection of RPCs performed as part of this study showed residual product labels (stickers), plant materials and free moisture on RPCs identified as clean. However, most of the RPCs evaluated (93%) met acceptable levels for *Enterobacteriaceae* and thermotolerant coliforms with a maximum microbial load of 14,300 CFU/RPC.

The primary goal of this study was to determine if a correlation between the results of a rapid ATP bioluminescence test and microbial loads on the RPC surface could be made. The results show that high RLU values were identified on RPC with little to no microbial load while the RPC with the highest microbial load (above acceptable levels) had an RLU value of 10; this value falls within the ATP instrument manufacturer's "Acceptable" range. Therefore, although the use of rapid ATP testing has been identified as a means to assess the cleanliness of food contact surfaces and an associated microbial loads, in this study, the comparative analysis did not show a correlation between the level of *Enterobacteriaceae* and thermotolerant coliforms on the RPC surface and the RLU value.

Sincerely yours,
HALEY & ALDRICH, INC.

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Regulatory Compliance Specialist

Maryann Sanders
Senior Regulatory Compliance Specialist
Microbiologist

Attachments:

- Appendix A: California Location 1 Data
- Appendix B: California Location 2 Data
- Appendix C: British Columbia Data

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7. Sanders, M. 2015b. Assessing the Potential of Single-Use Corrugated and Multi-Use Plastic Containers to Harbor and Transfer Microbial Loads. Internal FBA report. March 2015.

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APPENDIX A

California Location 1 Data

CALIFORNIA LOCATION 1 DATA
RANDOM RPC RESULTS

Relative Light Units (RLU) per Container

Number of Containers	RLU <1	RLU ≥1 but <10	RLU ≥10 but <100
24	10	13	1

Relative Light Units (RLU) per Sponge/Swab Sample

Number of Samples	RLU <1	RLU ≥1 but <10	RLU ≥10 but <100
48	29	17	2

Total Organisms and RLU per random RPC

Number of RPCs Sampled	Number of RPCs with <10 CFU/Container	RLU range for RPCs with <10 CFU/Container	Number of RPCs with ≥10 but <100 CFU/Container	RLU range for RPCs with ≥10 but <100 CFU/Container	Number of RPCs with ≥100 but <1000 CFU/Container	RLU range for RPCs with ≥100 but <1000 CFU/Container
24	16	0-33	7	0-2	1	1

Total Organisms and RLU per Sponge/Swab Sample

Number of Sponge/Swab Samples (two samples/RPC)	Number of Sponge Samples with <10 CFU/Sample	RLU range for Sponge Samples with <10 CFU/Sample	Number of Sponge Samples with ≥10 but <100 CFU/Sample	RLU range for Sponge Samples with ≥10 but <100 CFU/Sample	Number of Sponge Samples with ≥100 but <1000 CFU/Sample	RLU range for Sponge Samples with ≥100 but <1000 CFU/Sample
48	38	0-17	9	0-1	1	0

Coliform and RLU per RPC

Number of RPCs Sampled	Number of RPCs with <10 CFU/Container	RLU range for RPCs with <10 CFU/Container	Number of RPCs with ≥10 but <100 CFU/Container	RLU range for RPCs with ≥10 but <100 CFU/Container	Number of RPCs with ≥100 CFU/Container	RLU range for RPCs with ≥100 CFU/Container
24	16	0-33	7	0-2	1	0

Coliform and RLU per Sponge/Swab Sample

Number of Sponge/Swab Samples (two samples/RPC)	Number of Sponge Samples with <10 CFU/Sample	RLU range for Sponge Samples with <10 CFU/Sample	Number of Sponge Samples with ≥10 but <100 CFU/Sample	RLU range for Sponge Samples with ≥10 but <100 CFU/Sample	Number of Sponge Samples with ≥100 CFU/Sample	RLU range for Sponge Samples with ≥100 CFU/Sample
48	38	0-17	9	0-1	1	0

***Enterobacteriaceae* and RLU per RPC**

Number of RPCs Sampled	Number of RPCs with <10 CFU/Container	RLU range for RPCs with <10 CFU/Container	Number of RPCs with ≥10 but <100 CFU/Container	RLU range for RPCs with ≥10 but <100 CFU/Container
24	22	0-33	2	0-1

***Enterobacteriaceae* and RLU per Sponge/Swab Samples**

Number of Sponge Samples (two sponge samples/RPC)	Number of Sponge Samples with <10 CFU/Sample	RLU range for Sponge Samples with <10 CFU/Sample	Number of Sponge Samples with ≥10 but <100 CFU/Sample	RLU range for Sponge Samples with ≥10 but <100 CFU/Sample
48	46	0-17	2	0

CALIFORNIA LOCATION 1 DATA
FOR CAUSE RPC RESULTS

Total organisms per RPCs

Number of RPCs Sampled	Number of RPCs with <10 CFU/Container	Number of RPCs with ≥1 but <10 CFU/Container	Number of RPCs with ≥10 but <100 CFU/Container
12	4	2	6

Total organisms per Sponge Sample

Number of Sponge Samples (two sponge samples/RPC)	Number of Sponge Samples with <10 CFU/Sample	Number of Sponge Samples with ≥1 but <10 CFU/Sample	Number of Sponge Samples with ≥10 but <100 CFU/Sample
36	25	4	7

Coliforms per RPCs

Number of RPCs Sampled	Number of RPCs with <10 CFU/Container	Number of RPCs with ≥1 but <10 CFU/Container	Number of RPCs with ≥10 but <100 CFU/Container
12	4	2	6

Coliforms per Sponge Sample

Number of Sponge Samples (two sponge samples/RPC)	Number of Sponge Samples with <10 CFU/Sample	Number of Sponge Samples with ≥1 but <10 CFU/Sample	Number of Sponge Samples with ≥10 but <100 CFU/Sample
36	25	4	7

Enterobacteriaceae **per RPCs**

Number of RPCs Sampled	Number of RPCs with <10 CFU/Container
12	12

Enterobacteriaceae **per Sponge Sample**

Number of Sponge Samples (two sponge samples/RPC)	Number of Sponge Samples with <10 CFU/Sample
36	36

APPENDIX B

California Location 2 Data

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CALIFORNIA LOCATION 2 DATA
RANDOM RPC RESULTS

Relative Light Units (RLU) per RPC

Number of Containers	RLU <1	RLU ≥1 but <10	RLU ≥10 but <100	RLU ≥100 but <1000
24	2	9	11	2

Relative Light Units (RLU) per Sponge Sample

Number of Samples	RLU <1	RLU ≥1 but <10	RLU ≥10 but <100	RLU ≥100 but <1000
48	17	18	11	2

Total Organism and RLU per RPC

Number of RPCs Sampled	Number of RPCs with <10 CFU/Container	RLU range for RPCs with <10 CFU/Container	Number of RPCs with ≥10 but <100 CFU/Container	RLU range for RPCs with ≥10 but <100 CFU/Container	Number of RPCs with ≥100 but <1000 CFU/Container	RLU range for RPCs with ≥100 but <1000 CFU/Container	Number of RPCs with ≥1000 CFU/Container	RLU range for RPCs with ≥1000 CFU/Container	Number of RPCs with ≥10,000 CFU/Container	RLU range for RPCs with ≥10,000 CFU/Container
24	6	0-155	14	0-62	3	11-155	0	Not Applicable	1	10

Total Organism and RLU per Sponge Sample

Number of Sponge Samples (two samples/RPC)	Number of Sponge Samples with <10 CFU/Sample	RLU range for Sponge Samples with <10 CFU/Sample	Number of Sponge Samples with ≥10 but <100 CFU/Sample	RLU range for Sponge Samples with ≥10 but <100 CFU/Sample	Number of Sponge Samples with ≥100 but <1000 CFU/Sample	RLU range for Sponge Samples with ≥100 but <1000 CFU/Sample	Number of Sponge Samples with ≥1000 CFU/Sample	RLU range for Sponge Samples with ≥1000 CFU/Sample	Number of Sponge Samples with ≥10,000 CFU/Sample	RLU range for Sponge Samples with ≥10,000 CFU/Sample
48	24	0-130	20	0-60	3	11-149	1	10	1	10

Coliforms and RLU per RPC

Number of RPCs Sampled	Number of RPCs with <10 CFU/Container	RLU range for RPCs with <10 CFU/Container	Number of RPCs with ≥10 but <100 CFU/Container	RLU range for RPCs with ≥10 but <100 CFU/Container	Number of RPCs with ≥100 but <1000 CFU/Container	RLU range for RPCs with ≥100 but <1000 CFU/Container	Number of RPCs with ≥1000 CFU/Container	RLU range for RPCs with ≥1000 CFU/Container
24	7	1-130	14	0-62	2	69-155	1	10

Coliforms and RLU per Sponge Sample

Number of Sponge Samples (two samples/RPC)	Number of Sponge Samples with <10 CFU/Sample	RLU range for Sponge Samples with <10 CFU/Sample	Number of Sponge Samples with ≥10 but <100 CFU/Sample	RLU range for Sponge Samples with ≥10 but <100 CFU/Sample	Number of Sponge Samples with ≥100 but <1000 CFU/Sample	RLU range for Sponge Samples with ≥100 but <1000 CFU/Sample	Number of Sponge Samples with ≥1000 CFU/Sample	RLU range for Sponge Samples with ≥1000 CFU/Sample
48	24	0-130	21	0-33	2	0-149	1	10

Enterobacteriaceae **and RLU per RPC**

Number of RPCs Sampled	Number of RPCs with <10 CFU/Container	RLU range for RPCs with <10 CFU/Container	Number of RPCs with ≥10 but <100 CFU/Container	RLU range for RPCs with ≥10 but <100 CFU/Container	Number of RPCs with ≥100 but <1000 CFU/Container	RLU range for RPCs with ≥100 but <1000 CFU/Container	Number of RPCs with ≥1000 CFU/Container	RLU range for RPCs with ≥1000 CFU/Container	Number of RPCs with ≥10,000 CFU/Container	RLU range for RPCs with ≥10,000 CFU/Container
24	16	0-155	5	3-69	2	11-30	0	0	1	10

Enterobacteriaceae **and RLU per Sponge Sample**

Number of Sponge Samples (two samples/RPC)	Number of Sponge Samples with <10 CFU/Sample	RLU range for Sponge Samples with <10 CFU/Sample	Number of Sponge Samples with ≥10 but <100 CFU/Sample	RLU range for Sponge Samples with ≥10 but <100 CFU/Sample	Number of Sponge Samples with ≥100 but <1000 CFU/Sample	RLU range for Sponge Samples with ≥100 but <1000 CFU/Sample	Number of Sponge Samples with ≥1000 but <10000 CFU/Sample	RLU range for Sponge Samples with ≥1000 but <10000 CFU/Sample	Number of Sponge Samples with ≥10,000 CFU/Sample	RLU range for Sponge Samples with ≥10,000 CFU/Sample
48	40	0-149	5	1-69	2	11-30	0	0	1	10

CALIFORNIA LOCATION 2 DATA
FOR CAUSE RPC RESULTS

Relative Light Units (RLU) per RPC

Number of Containers	RLU <1	RLU ≥1 but <10	RLU ≥10 but <100	RLU ≥100 but <1000
12	2	2	5	3

Relative Light Units (RLU) per Sponge Sample

Number of Samples	RLU <1	RLU ≥1 but <10	RLU ≥10 but <100	RLU ≥100 but <1000
36	11	15	8	2

Total Organism and RLU per RPC

Number of RPCs Sampled	Number of RPCs with <10 CFU/Container	RLU range for RPCs with <10 CFU/Container	Number of RPCs with ≥10 but <100 CFU/Container	RLU range for RPCs with ≥10 but <100 CFU/Container	Number of RPCs with ≥100 CFU/Container	RLU range for RPCs with ≥100 but <1000 CFU/Container
12	4	0-429	5	0-176	3	15-77

Total Organism and RLU per Sponge Sample

Number of Sponge Samples (two samples/RPC)	Number of Sponge Samples with <10 CFU/Sample	RLU range for Sponge Samples with <10 CFU/Sample	Number of Sponge Samples with ≥10 but <100 CFU/Sample	RLU range for Sponge Samples with ≥10 but <100 CFU/Sample	Number of Sponge Samples with ≥100 but <1000 CFU/Sample	RLU range for Sponge Samples with ≥100 but <1000 CFU/Sample
36	27	0-412	7	0-112	2	1-67

Coliforms and RLU per RPC

Number of RPCs Sampled	Number of RPCs with <10 CFU/Container	RLU range for RPCs with <10 CFU/Container	Number of RPCs with ≥10 but <100 CFU/Container	RLU range for RPCs with ≥10 but <100 CFU/Container	Number of RPCs with ≥100 CFU/Container	RLU range for RPCs with ≥100 but <1000 CFU/Container
12	4	0-429	5	0-176	3	9-77

Coliforms and RLU per Sponge Sample

Number of Sponge Samples (two samples/RPC)	Number of Sponge Samples with <10 CFU/Sample	RLU range for Sponge Samples with <10 CFU/Sample	Number of Sponge Samples with ≥10 but <100 CFU/Sample	RLU range for Sponge Samples with ≥10 but <100 CFU/Sample	Number of Sponge Samples with ≥100 but <1000 CFU/Sample	RLU range for Sponge Samples with ≥100 but <1000 CFU/Sample
36	22	0-412	12	0-112	2	1-67

***Enterobacteriaceae* and RLU per RPC**

Number of RPCs Sampled	Number of RPCs with <10 CFU/Container	RLU range for RPCs with <10 CFU/Container	Number of RPCs with ≥10 but <100 CFU/Container	RLU range for RPCs with ≥10 but <100 CFU/Container	Number of RPCs with ≥100 CFU/Container	RLU range for RPCs with ≥100 but <1000 CFU/Container
12	11	0-429	1	15	0	Not Applicable

***Enterobacteriaceae* and RLU per Sponge Sample**

Number of Sponge Samples (two samples/RPC)	Number of Sponge Samples with <10 CFU/Sample	RLU range for Sponge Samples with <10 CFU/Sample	Number of Sponge Samples with ≥10 but <100 CFU/Sample	RLU range for Sponge Samples with ≥10 but <100 CFU/Sample	Number of Sponge Samples with ≥100 but <1000 CFU/Sample	RLU range for Sponge Samples with ≥100 but <1000 CFU/Sample
36	35	0-412	1	1	0	Not Applicable

APPENDIX C

British Columbia Data

BRITISH COLUMBIA DATA
RANDOM RPC RESULTS

Relative Light Units (RLU) per RPC

Number of Containers	RLU <1	RLU ≥1 but <10	RLU ≥10 but <100	RLU ≥100 but <1000
24	7	12	3	2

Relative Light Units (RLU) per Sponge Sample

Number of Samples	RLU <1	RLU ≥1 but <10	RLU ≥10 but <100	RLU ≥100 but <1000
48	23	21	3	1

Total Organism and RLU per RPC

Number of RPCs Sampled	Number of RPCs with <10 CFU/Container	RLU range for RPCs with <10 CFU/Container	Number of RPCs with ≥10 but <100 CFU/Container	RLU range for RPCs with ≥10 but <100 CFU/Container	Number of RPCs with ≥100 but <1000 CFU/Container	RLU range for RPCs with ≥100 but <1000 CFU/Container	Number of RPCs with ≥1000 CFU/Container	RLU range for RPCs with ≥1000 CFU/Container
24	15	0-26	2	0	3	7-105	4	3-101

Total Organism Count and RLU per Sponge Sample

Number of Sponge Samples (two sponge samples/RPC)	Number of Sponge Samples with <10 CFU/Sample	RLU range for Sponge Samples with <10 CFU/Sample	Number of Sponge Samples with ≥10 but <100 CFU/Sample	RLU range for Sponge Samples with ≥10 but <100 CFU/Sample	Number of Sponge Samples with ≥100 but <1000 CFU/Sample	RLU range for Sponge Samples with ≥100 but <1000 CFU/Sample	Number of Sponge Samples with ≥1000 CFU/Sample	RLU range for Sponge Samples with ≥1000 CFU/Sample
48	37	0-21	3	0	4	7-97	4	3-100

Coliform and RLU per RPC

Number of RPCs Sampled	Number of RPCs with <10 CFU/Container	RLU range for RPCs with <10 CFU/Container	Number of RPCs with ≥10 but <100 CFU/Container	RLU range for RPCs with ≥10 but <100 CFU/Container	Number of RPCs with ≥100 but <1000 CFU/Container	RLU range for RPCs with ≥100 but <1000 CFU/Container	Number of RPCs with ≥1000 CFU/Container	RLU range for RPCs with ≥1000 CFU/Container
24	22	0-100	2	0-6	0	Not Applicable	0	Not Applicable

Coliform and RLU per Sponge Samples

Number of Sponge Samples (two sponge samples/RPC)	Number of Sponge Samples with <10 CFU/Sample	RLU range for Sponge Samples with <10 CFU/Sample	Number of Sponge Samples with ≥10 but <100 CFU/Sample	RLU range for Sponge Samples with ≥10 but <100 CFU/Sample	Number of Sponge Samples with ≥100 but <1000 CFU/Sample	RLU range for Sponge Samples with ≥100 but <1000 CFU/Sample	Number of Sponge Samples with ≥1000 CFU/Sample	RLU range for Sponge Samples with ≥1000 CFU/Sample
48	44	0-101	4	0-6	0	Not Applicable	0	Not Applicable

Enterobacteriaceae **and RLU per RPC**

Number of RPCs Sampled	Number of RPCs with <10 CFU/Container	RLU range for RPCs with <10 CFU/Container	Number of RPCs with ≥10 but <100 CFU/Container	RLU range for RPCs with ≥10 but <100 CFU/Container	Number of RPCs with ≥100 but <1000 CFU/Container	RLU range for RPCs with ≥100 but <1000 CFU/Container	Number of RPCs with ≥1000 CFU/Container	RLU range for RPCs with ≥1000 CFU/Container
24	17	0-26	0	Not Applicable	3	7-105	4	3-101

Enterobacteriaceae **and RLU per Sponge Sample**

Number of Sponge Samples (two sponge samples/RPC)	Number of Sponge Samples with <10 CFU/Sample	RLU range for Sponge Samples with <10 CFU/Sample	Number of Sponge Samples with ≥10 but <100 CFU/Sample	RLU range for Sponge Samples with ≥10 but <100 CFU/Sample	Number of Sponge Samples with ≥100 but <1000 CFU/Sample	RLU range for Sponge Samples with ≥100 but <1000 CFU/Sample	Number of Sponge Samples with ≥1000 but <10000 CFU/Sample	RLU range for Sponge Samples with ≥1000 but <10000 CFU/Sample
48	40	0-21	0	Not Applicable	4	7-97	4	3-100

BRITISH COLUMBIA DATA
FOR CAUSE RPC RESULTS

Relative Light Units (RLU) per RPC

Number of Containers	RLU <1	RLU ≥1 but <10	RLU ≥10 but <100	RLU ≥100 but <1000
12	Not Determined (ND)	ND	ND	ND

Relative Light Units (RLU) per Sponge/Swab Sample

Number of Samples	RLU <1	RLU ≥1 but <10	RLU ≥10 but <100	RLU ≥100 but <1000
36	ND	ND	ND	ND

Total organisms per RPC

Number of RPCs Sampled	Number of RPCs with <10 CFU/Container	RLU range for RPCs with <10 CFU/Container	Number of RPCs with ≥10 but <100 CFU/Container	RLU range for RPCs with ≥10 but <100 CFU/Container	Number of RPCs with ≥100 CFU/Container	RLU range for RPCs with ≥100 but <1000 CFU/Container
12	7	ND	4	ND	1	ND

Total organisms per Sponge/Swab Sample

Number of Samples (three samples/RPC)	Number of Sponge Samples with <10 CFU/Sample	RLU range for Sponge Samples with <10 CFU/Sample	Number of Sponge Samples with ≥10 but <100 CFU/Sample	RLU range for Sponge Samples with ≥10 but <100 CFU/Sample	Number of Sponge Samples with ≥100 but <1000 CFU/Sample	RLU range for Sponge Samples with ≥100 but <1000 CFU/Sample
36	28	ND	6	ND	2	ND

Coliforms per RPC

Number of RPCs Sampled	Number of RPCs with <10 CFU/Container	RLU range for RPCs with <10 CFU/Container	Number of RPCs with ≥10 but <100 CFU/Container	RLU range for RPCs with ≥10 but <100 CFU/Container	Number of RPCs with ≥100 CFU/Container	RLU range for RPCs with ≥100 but <1000 CFU/Container
12	11	ND	1	ND	0	Not Applicable

Coliforms per Sponge/Swab Sample

Number of Samples (three samples/RPC)	Number of Sponge Samples with <10 CFU/Sample	RLU range for Sponge Samples with <10 CFU/Sample	Number of Sponge Samples with ≥10 but <100 CFU/Sample	RLU range for Sponge Samples with ≥10 but <100 CFU/Sample	Number of Sponge Samples with ≥100 but <1000 CFU/Sample	RLU range for Sponge Samples with ≥100 but <1000 CFU/Sample
36	34	ND	2	ND	0	Not Applicable

Enterobacteriaceae **per RPC**

Number of RPCs Sampled	Number of RPCs with <10 CFU/Container	RLU range for RPCs with <10 CFU/Container	Number of RPCs with ≥10 but <100 CFU/Container	RLU range for RPCs with ≥10 but <100 CFU/Container	Number of RPCs with ≥100 CFU/Container	RLU range for RPCs with ≥100 but <1000 CFU/Container
12	9	ND	2	ND	1	ND

Enterobacteriaceae **per Sponge/Swab Sample**

Number of Sponge Samples (three samples/RPC)	Number of Sponge Samples with <10 CFU/Sample	RLU range for Sponge Samples with <10 CFU/Sample	Number of Sponge Samples with ≥10 but <100 CFU/Sample	RLU range for Sponge Samples with ≥10 but <100 CFU/Sample	Number of Sponge Samples with ≥100 but <1000 CFU/Sample	RLU range for Sponge Samples with ≥100 but <1000 CFU/Sample
36	31	ND	3	ND	2	ND