IN-STORE SANITIZER EVALUATION

1. Introduction

Food safety has always been the highest priority for food processing facilities and the food service industry. The entire industry strives to prevent food based contamination, and one area of focus is proper sanitization products and procedures. Until now the food industry has been limited to products that only perform as sanitizers, defined by the US EPA as a product that will reduce, but not eliminate, microorganisms from a surface, at the concentrations allowed on food contact surfaces. Ensuring that the sanitizer solution is properly diluted and maintained at an effective concentration creates an additional challenge in the quick service food industry of compliance with restaurant sanitation The food industry has become accustomed to using harsh and potentially ineffective chemicals as part of their food safety practices; however, concerns over use of these chemicals has opened the door to new technologies that can provide a safer solution with greater microbial control than current toxic chemicals. As a disinfectant, which is defined by the US EPA as a product that destroys or irreversibly inactivates pathogens, PURE Hard surface disinfectant offers greater control of microorganisms, and is approved for use on food contact surfaces as formulated.

2. Objective

The objective of this study was to compare the overall effectiveness of PURE Hard Surface disinfectant (PURE) to the current in-store sanitizer of a leading Quick Service Restaurant (QSR) when used for sanitizing surfaces throughout the facility. Evaluation was based on ATP bioluminescence meter readings (3M Clean-Trace™ ATP Surface Test) of designated areas, in duplicate, at multiple times during the day. The current sanitizer will be evaluated for two (2) days followed by two (2) days using PURE. It is expected that overall sanitation (RLU) will improve (decrease) with the implementation of PURE Hard Surface disinfectant. Since this experiment will be conducted outside of the laboratory, and in an environment that is not well controlled, there will be random variables which cannot be controlled that could influence the study results.

APC, yeast and mold counts will be taken from test areas in at least one restaurant.

3. ATP Meter

ATP bioluminescence meters are widely used in the food industry as a means of rapid evaluation of the overall sanitary conditions of the environment. Adenosine – 5′ –triphosphate (ATP) is found in and around all living cells and is the main energy carrier for all living life forms. Measuring ATP concentration in a sample provides a direct measurement of the biological contamination on the tested surface. An ATP meter quantifies the amount of ATP on a test surface by measuring the light produced through a reaction between ATP and the enzyme luciferase. The formula below outlines this reaction:

$$ATP + O_2 + D\text{-}luciferin \xrightarrow[Mg^{2+}]{luciferace} AMP + PPi + oxyluciferin + \mathbf{light}$$

In the presence of the enzyme luciferase, the ATP collected on the Clean-Trace ATP Surface Test swab reacts with oxygen and the light emitting pigment luciferin resulting in the emission of photons of green-yellow light.

According to 3M, the manufacturer of the Clean-Trace swabs and ATP meter, the Clean-Trace system was designed to reduce interference of the bioluminescence assay by common chemical sanitizers used at typical concentrations in the food industry.

In order to ascertain whether PURE Hard Surface disinfectant would interfere with the bioluminescence assay and lead to false positive or false negative, an informal comparison of the ATP reading (RLU) for an organic material was compared to the ATP reading for the same organic material mixed with PURE Hard Surface disinfectant. Experimenters observed an initial RLU reading of 84,165 and an RLU of 85,766 after adding PURE Hard Surface disinfectant to the organic material. These numbers are within an acceptable range to suggest that PURE Hard Surface disinfectant does not significantly interfere with the bioluminescence assay. The swabs taken in this study were from dry surfaces, further minimizing any potential for interference with the ATP assay.

4. Method and Procedures

4.1 Current In-store product – Day 1 and 2

Each restaurant was using a chain approved, EPA registered quaternary ammonia (QUAT) sanitizer, which was diluted and dispensed into the 3rd sink chamber at the washing station. The product label instructions state that the product should be diluted between 150 ppm – 400 ppm active. Dilution and dispensing is achieved using an installed metering system and test strips are available on-site to confirm proper dilution. General practice is for employees to fill red sanitizer buckets from the third sink for use to sanitize surfaces throughout the restaurant.

ATP swabs were taken from each of the stores in the morning, between 6 -8 AM and in the afternoon, between 2-4 PM both days. Employees were instructed by test personnel to follow regular sanitation practices using their current product. Test personnel proceeded to take ATP samples from the designated test areas. When testing the beverage machine on day 1, testing personnel used the stores existing sanitizer bucket and cloth to sanitize the nozzles before taking the post-sanitization ATP reading.

4.2 PURE Hard Surface disinfectant and food contact surface sanitizer- Days 3 through 5

On day 3, each restaurant was provided a stock of PURE Hard Surface disinfectant in trigger spray quart bottles. Test personnel educated the employees about the product and explained how it should be used throughout the facility. Employees were instructed to use PURE Hard Surface disinfectant for all surface cleaning/sanitizing for the remainder of the test. Employees were advised to continue to use the current sink sanitizer for all sink sanitizing operations, with exception of the produce slicer. Test personnel removed all red sanitizer buckets so that they were not readily available to avoid adulterating the study. Test personnel proceeded to sanitize surfaces throughout the restaurants to demonstrate to employees the ease of using PURE Hard Surface disinfectant. Instructions for sanitizing the produce slicer were discussed with morning and afternoon employees. No dispenser nozzles were cleaned on day 3 and employees were asked not to soak the nozzles that evening if it was currently the practice, to allow for an appropriate initial reading the next test day.

On day 4 and 5, ATP swabs were taken from each of the restaurants in the morning, between 6 -8 AM and in the afternoon, between 2-4 PM.

4.3 Test Surfaces

*Beverage Dispenser**
Nozzle, External – 4
Nozzle, Internal – 4
Ice Chute – Internal – 2 sites

Food Prep Counter
Area – 1
Area – 2

Produce Slicer
Collect Board
Blades

Front Counter
Employee Side
Customer Side

Main Store
Dining Table – 2 tables

Back of Store
Food prep tables – 2 tables or 2 areas of one table if only one table is present.

** A separate set of 4 nozzles was tested for each of the sanitizers. The internal nozzles correspond with the tested exterior nozzles.*

Test cycle: A test cycle represents the testing of a surface each day. There are 2 test cycles per surface per day which equates to 8 test cycles per surface over the 4 test days.

4.4 Sanitizing with PURE Hard Surface disinfectant

Employees were instructed to clean/sanitize all surfaces using PURE Hard Surface disinfectant in the same manner they would when using their current product, except that PURE Hard Surface disinfectant is applied from a trigger spray bottle rather than from a sanitizer bucket and wiped with cloths supplied.

The produce slicer is typically cleaned in the three compartment sink and soaked in the 3rd sink sanitizing solution. On the PURE test days, employees were instructed to clean and rinse the slicer in sinks 1 and 2, then apply PURE Hard Surface disinfectant to the slicer until thoroughly wet while sitting in the second sink for at least two minutes. The slicers were rinsed before setting on the rack to air dry.

Most restaurants removed the beverage nozzles each evening and soaked them in the quaternary ammonia solution overnight. On PURE test day 4, employees were instructed to soak the nozzles in PURE Hard Surface disinfectant overnight.

4.5 Sample collection methods

In accordance with the manufacturer's instructions, testing personnel removed swab from container and swabbed a 4" x 4" section of the indicated test surface while rotating swab to ensure sufficient contact with the test surface. Figure 1 below indicates the swab pattern. The swab was reinserted into the swab container and pushed into the locked position for activation. The swab was shaken side to side for approximately 5 seconds and then inserted into the meter for ATP reading.

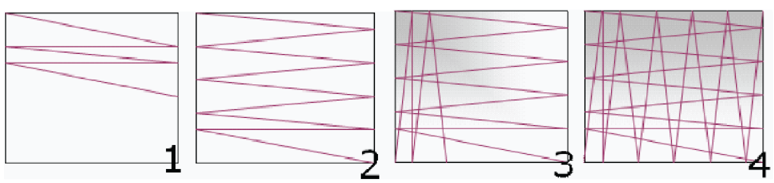

Figure 1. Illustration of the swabbing pattern used in a 4" x 4" area.

For surfaces too small to achieve a 4" x 4" test area, such as the beverage dispenser nozzles, the entire surface was swabbed following the pattern in Figure 1 above. The ice chute of the beverage machine was divided into right and left sides and swabbed following the pattern in Figure 1 above. The produce slicer blades were swabbed by running the swab the length of each blade and a separate swab was taken of the entire surface of the slicer collection board.

To collect samples for plate counts, a pre-moistened sterile sponge was used to swab each area tested following the pattern in Figure 1 above. The first pass of the test area was done with the sponge in an up and down direction. The sponge was then flipped over and the area was swabbed in a left to right direction. The sponges were marked and sent to Silliker Labs' Cypress facility for APC, Yeast and Mold analysis.

5. Results

Overall sanitation was evaluated based upon the reduction in ATP measurements as Relative Light Units (RLU). For all restaurants, the overall aggregated reduction in RLUs achieved after implementation of PURE Hard Surface disinfectant was 96% with a standard deviation of 4% (Figure 2, Table 1).

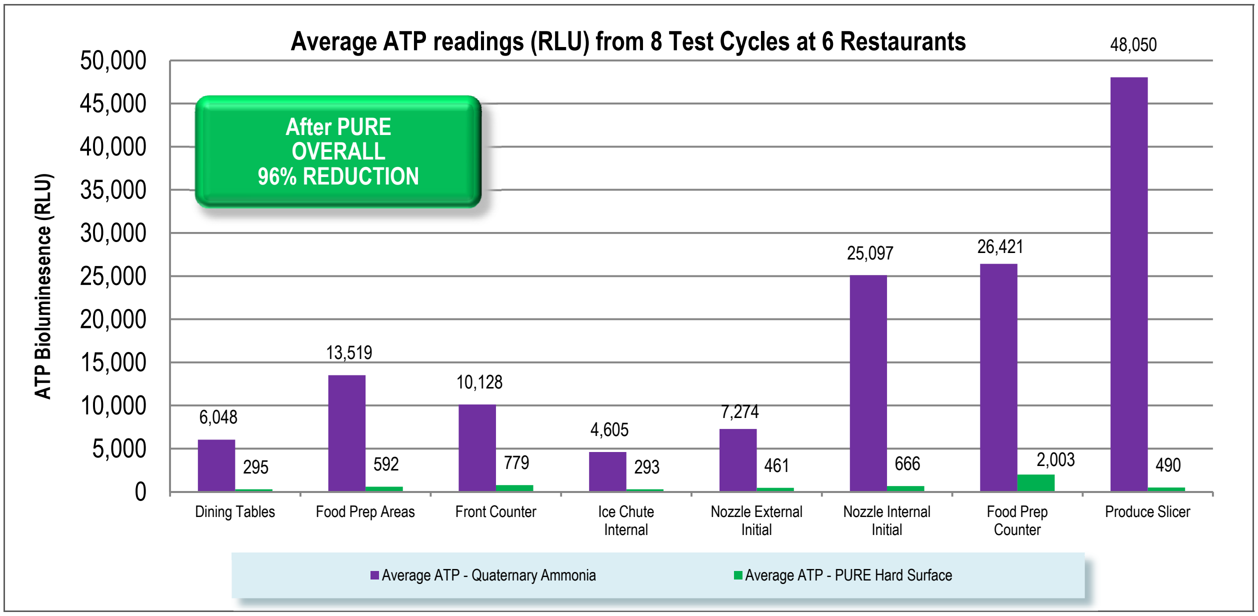

Figure 2. Total ATP Readings (RLU) from 8 Test Cycles at 6 Restaurants

For non-beverage dispenser use sites, the overall aggregated reduction in RLUs achieved after implementation of PURE Hard Surface disinfectant was 96% ± 3%. The RLUs on dining tables were reduced 95% ± 4%, RLUs on the food preparation tables in the back of the store were reduced 95% ± 6%, RLUs on the front counter were reduced 91% ± 15%, RLUs on the food preparation counters were reduced 92% ± 5%, RLUs on the produce slicer blades were reduced 99% ± 10% and the RLUs on the collection board were reduced 99% ± 6% (Figure 3, Table 2).

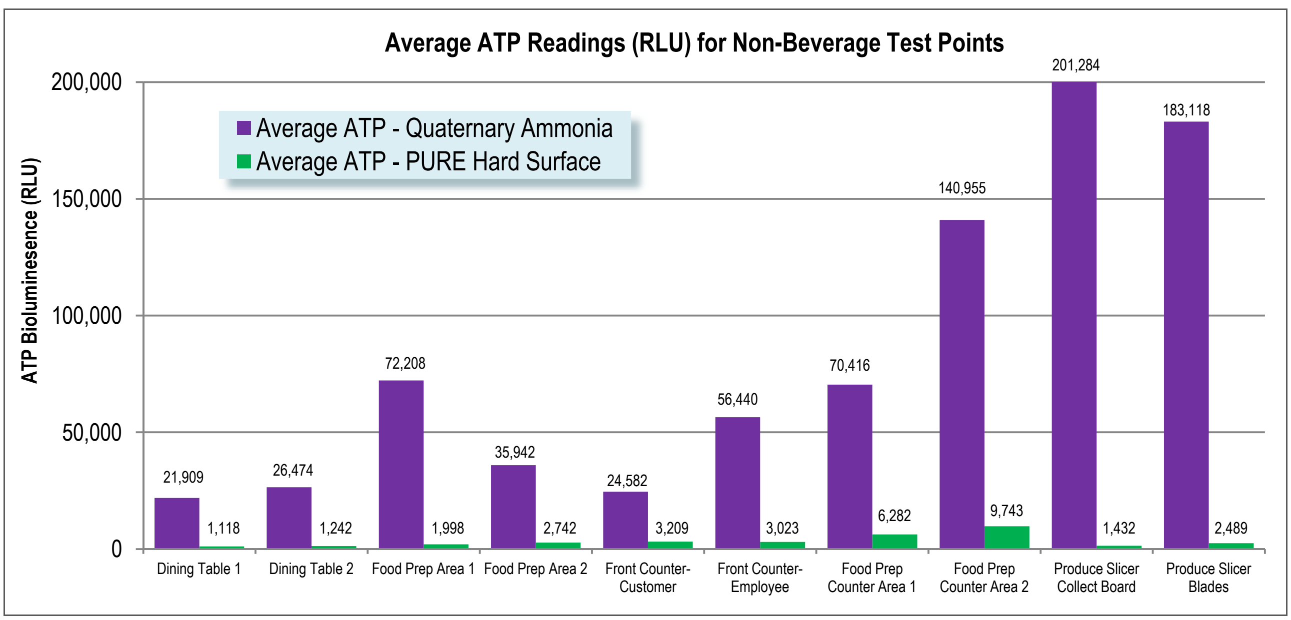

Figure 3. Average ATP (RLU) for Non-Beverage Test Points by product (See Table 2)

The exterior and interior of the beverage dispenser nozzles were tested and the aggregate reduction in RLUs achieved after implementation of PURE Hard Surface disinfectant was 96% ± 6% for the external nozzles and 98% ± 1% for the internal nozzles (Figure 4, Table 3). Immediately after sanitization of the external nozzles with quaternary ammonia, the RLUs reduced from 114,417 to 82,376 or 28% and the RLUs on the internal nozzles reduced from 673,909 to 316,428 or 53% (Figure 4). Immediately after sanitization of the external nozzles with PURE Hard Surface disinfectant the RLUs reduced from 122,914 to 18,585 or 85% and the RLUs on the internal nozzles reduced from 1,585,475 to 47,467 or 97% (Table 4).

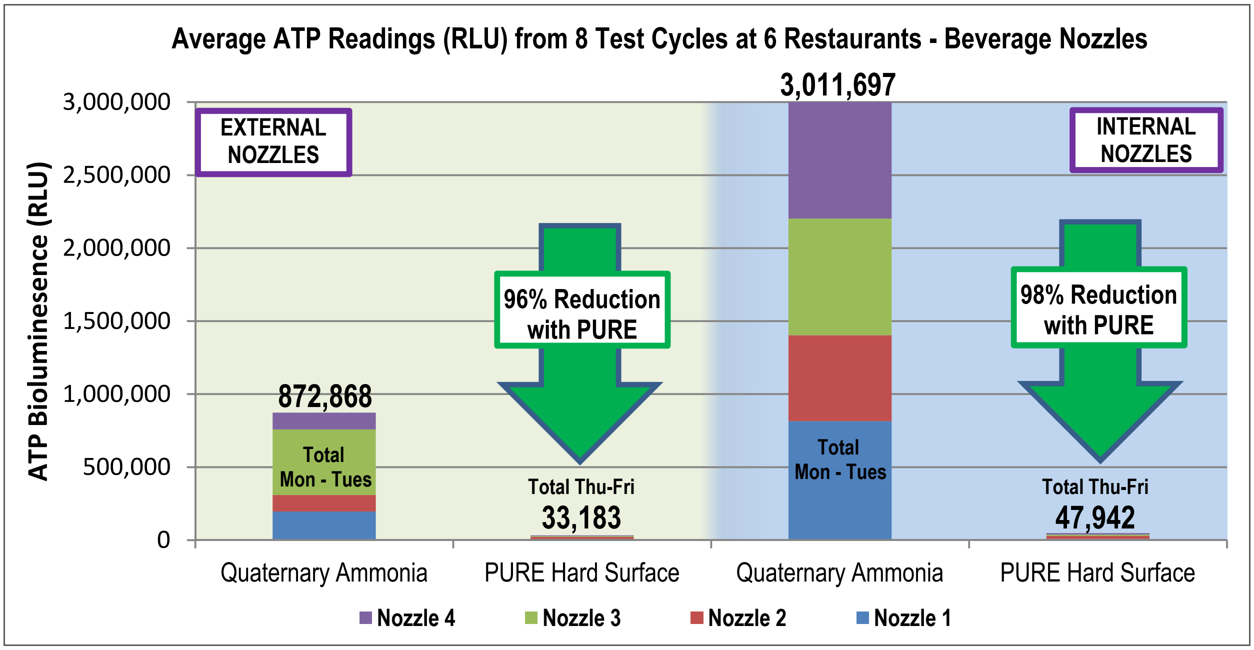

Figure 4. Average ATP (RLU) for Beverage Nozzles by product (See Table 3)

The overall reduction of the RLUs from the interior of the ice chute after implementation of PURE Hard Surface disinfectant was 94% ± 4% (Figure 5, Table 5).

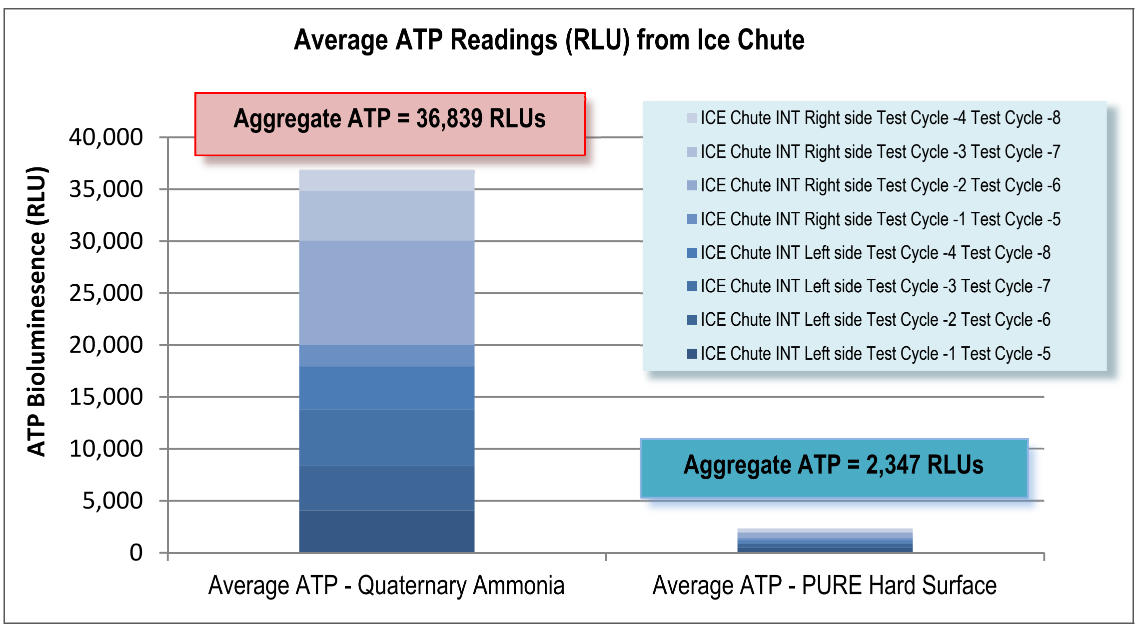

Figure 5: Average ATP (RLU) from Ice Chute (See Table 5)

The average overall reduction of the RLUs on the produce slicer after implementation of PURE Hard Surface disinfectant was 99% ± 7%. The average reduction of the RLUs on the slicer collection board after implementation of PURE Hard Surface disinfectant was 99% ± 6% and on the produce slicer blades, the reduction was 99% ± 10% (Figure 6, Table 6).

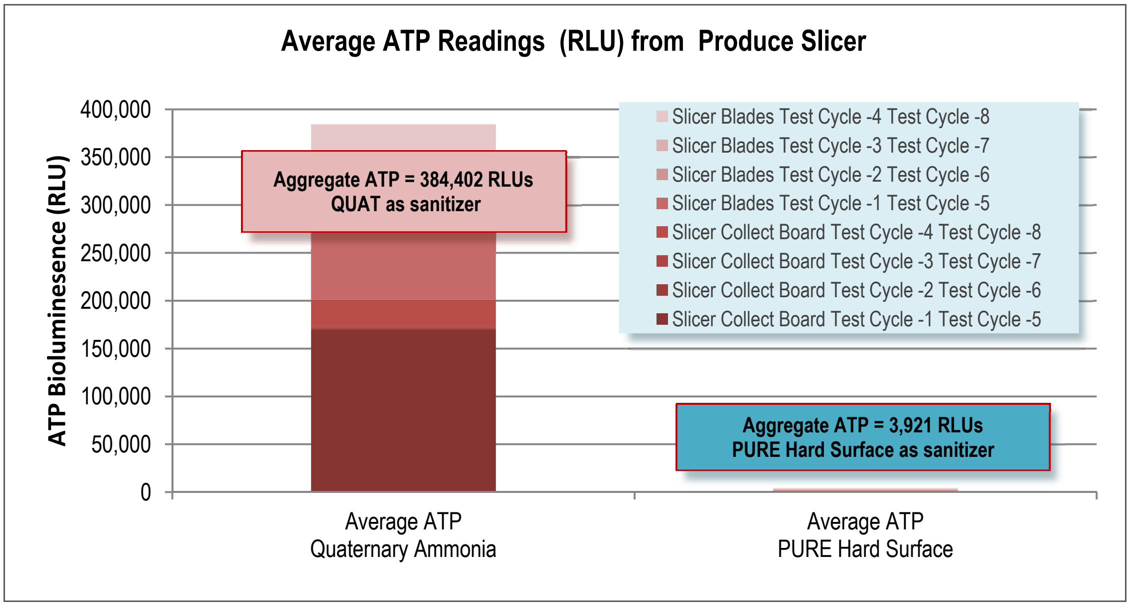

Figure 6: Average ATP (RLU) from Produce Slicer (See Table 6)

6. Correlation of ATP to Plate Counts

In addition to ATP readings, microbial swabs were taken from two produce slicers, one food preparation table, and one food preparation counter area The swabs were sent to Silliker Labs for APC, yeast and mold analysis. The relationship between the ATP reading and the total CFU is shown in Figure 7. Although there are few data points, the data shows a strong linear correlation between the ATP and microbial count with a slope of 0.07 ± 0.01 CFU per RLU and a Pearson correlation coefficient of 0.97. The Pearson correlation coefficient (R) is a measure of the strength of the linear relationship between two variables, where R=1.0 signifies a perfect correlation (Table 7).

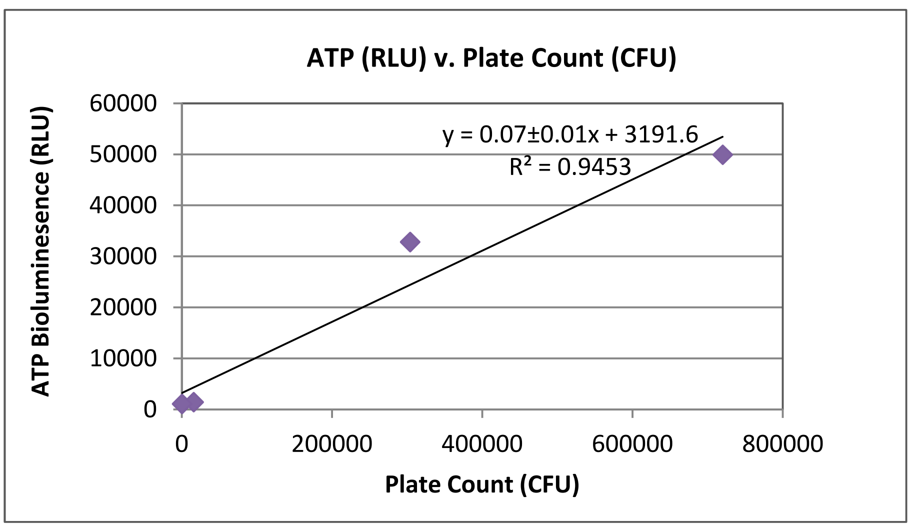

Figure 7: ATP (RLU) v. Plate Count (CFU)

7. Discussion

The objective of this study was to demonstrate that overall sanitation (RLU) would improve (decrease) with the implementation of PURE Hard Surface disinfectant when used to disinfect/sanitize surfaces throughout the facility. The efficacy of PURE Hard Surface disinfectant against a wide range of bacteria, viruses and fungi is well documented in numerous studies under controlled laboratory conditions. This real world study explored the benefit of using PURE Hard Surface disinfectant over the current quaternary ammonia based sanitizer when used according to the standard practice, which may not always follow specific label instructions and may vary from restaurant to restaurant.

There was an overall aggregate reduction in RLUs at all 6 restaurants of 96% with the implementation of PURE Hard Surface disinfectant. When broken down into test sites, the reduction in RLUs on non-beverage machine sites after implementation of PURE Hard Surface disinfectant was consistently greater than 90% where 3 out of 5 sites showed at least 95% reduction in RLUs. The RLUs on the external and internal beverage nozzles decreased 96% and 98% respectively when sanitized with PURE Hard Surface disinfectant. The RLUs from the ice chutes reduced 94% when sanitized with PURE Hard Surface disinfectant.

One of the most dramatic observations was in the effect of PURE Hard Surface disinfectant on the beverage nozzles. PURE Hard Surface disinfectant not only showed significant improvement in the cleanliness of the nozzles as determined by ATP measurement but also drastically improved the appearance of the nozzles. In many cases, the nozzles were discolored and looked aged prior to using PURE Hard Surface disinfectant. Many nozzles were difficult to remove from the dispenser and several of the internal nozzles showed significant biofilm build-up. After treating the beverage dispenser nozzles with PURE Hard Surface disinfectant, most of the staining was removed, the visible biofilm was cleared and the nozzles became easier to remove from the dispenser. The Regional Manager remarked on the drastic improvement in the appearance of the beverage dispensers to the Operations Manager.

The appearance of the stainless steel surfaces throughout the store was also improved after implementing PURE Hard Surface disinfectant. Employees from several restaurants shared with the test personnel how well PURE Hard Surface disinfectant worked to clean the stainless steel surfaces, and a number of restaurants did not need to use its stainless steel cleaner because PURE Hard Surface disinfectant worked so well.

In addition to the overall aesthetic benefit, PURE Hard Surface disinfectant provided and improved user experience. During visits to the restaurants, testing personnel heard complaints from every location of irritation, rashes, and dry skin due to the quaternary ammonia product. The employees appreciated the spray application which minimized exposure and many of the employees commented that PURE Hard Surface disinfectant did not irritate their skin. According to the employees, another benefit was the appearance of the bottle compared to the bucket of sanitizer. Employees felt that it improved the customer perception of cleanliness. Many employees also commented that they appreciated the lack of “chemical odor” from PURE Hard Surface disinfectant.

As a pre-formulated product, PURE Hard Surface disinfectant offers many benefits over the current quaternary ammonia product. In the concentrated form, the current quaternary ammonia product being used is a potential health and safety hazard. The MSDS states that the concentrate can cause skin and eye burns, is flammable and corrosive and harmful if swallowed. Further, if the dispensing unit is not functioning properly, there exists either a hazard of exposure to the product above the levels allowed by law for food contact surfaces or the potential for reduced efficacy due to insufficient levels of active. PURE Hard Surface disinfectant eliminates the potential for improper dilution.

The quaternary ammonia product in the sanitizer bucket must be replaced throughout the day. This requires employees to make a judgment of when to replace the solution, leading to potential variability of the efficacy of the solution. PURE Hard Surface disinfectant offers a pre-formulated solution that does not require replacement throughout the day and is stable for at least 2 years. Testing personnel dipped a test sponge in the sanitizer bucket at one restaurant and sent it for APC, yeast and mold analysis. The results showed an APC at 6,000 CFU, yeast at 260 CFU and mold at <10 CFU. This type of contamination leads to the potential for continual re-inoculation of surfaces if the solution is not replaced when necessary.

8. Conclusion

As expected, PURE Hard Surface disinfectant demonstrated a significant improvement in overall sanitation in every restaurant tested. PURE Hard Surface is registered for use on food contact surfaces, yet it also conveys complete broad-spectrum disinfection at the same concentration without the requirement of a rinse. Further, PURE Hard Surface provides 24-hour residual protection against standard indicator bacteria. According to its label, concentrations of the quaternary ammonia product allowed on food contact surfaces are insufficient to achieve disinfection. The results demonstrated in this study are supported by numerous third party laboratories studies and validated by the US EPA registration in which PURE Hard Surface disinfectant demonstrates greater than 99.999% reduction in microbial counts.

PURE Hard Surface disinfectant also reduces exposures to chemical hazards and eliminates the health and safety errors associated with improper dilution and/or accidental contact with the concentrated form of the sanitizer. Employee feedback suggests that PURE Hard Surface disinfectant may lead to better compliance with increased frequency of use based on the aesthetic benefits and ease of use. While the quaternary ammonia product has been in use for years, any long term benefit has already accrued. It is expected that the improved sanitation demonstrated by PURE Hard Surface disinfectant in the 2-day period of this study would continue to build with ongoing use.

Additional information and efficacy data for PURE Hard Surface disinfectant is available at http://technical.purebio.com or contact PURE Bioscience, Inc. at:

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Table 1 - Average ATP Readings (RLU) from 8 Test Cycles at 6 Restaurants

Test Points	# of test sites per store	Average ATP QUAT	Average ATP PURE Hard Surface	% Reduction using PURE Hard Surface	Standard Deviation
		TOTALS ALL TEAMS AND STORES Average ATP reading per test cycle per Store			
Dining Tables	2	6,048	295	95%	
Food Prep Areas	2	13,519	592	97%	
Front Counter	2	10,128	779	87%	
ICE Chute - Internal	2	4,605	293	93%	
External Nozzle Initial	4	7,274	461	95%	
Internal Nozzle Initial	4	25,097	666	98%	
Food Prep Counters	2	26,421	2,003	91%	
Produce Slicer	2	48,050	490	99%	
TOTAL-All Test Points		**141,142**	**5,580**	**96%**	**4%**

Table 2 - Average ATP Readings (RLU) from 8 Test Cycles at 6 Restaurants – All Non-Beverage Test Points

.			TOTALS ALL TEAMS AND STORES Average ATP reading per test cycle per Store			
Test Points			Average ATP - ***QUAT***	Average ATP - PURE Hard Surface	% Reduction using PURE Hard Surface	Standard Deviation
Dining Table 1	Test Cycle -1	Test Cycle -5	3,977	464	88%	
	Test Cycle -2	Test Cycle -6	5,177	307	94%	
	Test Cycle -3	Test Cycle -7	4,942	138	97%	
	Test Cycle -4	Test Cycle -8	7,814	210	97%	
TOTALS:		**Dining Table 1**	**21,909**	**1,118**	**95%**	4%
Dining Table 2	Test Cycle -1	Test Cycle -5	5,083	464	91%	
	Test Cycle -2	Test Cycle -6	6,530	218	97%	
	Test Cycle -3	Test Cycle -7	10,262	174	98%	
	Test Cycle -4	Test Cycle -8	4,599	388	92%	
TOTALS:		**Dining Table 2**	**26,474**	**1,242**	**95%**	4%
Food Prep Area 1	Test Cycle -1	Test Cycle -5	28,908	1,206	96%	
	Test Cycle -2	Test Cycle -6	17,415	273	98%	
	Test Cycle -3	Test Cycle -7	6,572	155	98%	
	Test Cycle -4	Test Cycle -8	19,313	364	98%	
TOTALS:		**Food Prep Area 1**	**72,208**	**1,998**	**97%**	1%
Food Prep Area 2	Test Cycle -1	Test Cycle -5	4,765	812	83%	
	Test Cycle -2	Test Cycle -6	14,814	320	98%	
	Test Cycle -3	Test Cycle -7	6,327	354	94%	
	Test Cycle -4	Test Cycle -8	10,035	1,257	87%	
TOTALS:		**Food Prep Area 2**	**35,942**	**2,742**	**92%**	7%
Front Counter-Customer	Test Cycle -1	Test Cycle -5	4,728	348	93%	
	Test Cycle -2	Test Cycle -6	5,011	2,300	54%	
	Test Cycle -3	Test Cycle -7	8,482	213	97%	
	Test Cycle -4	Test Cycle -8	6,361	349	95%	
TOTALS:		**FC Customer**	**24,582**	**3,209**	**87%**	20%
Front Counter-Employee	Test Cycle -1	Test Cycle -5	5,790	1,107	81%	
	Test Cycle -2	Test Cycle -6	21,054	508	98%	
	Test Cycle -3	Test Cycle -7	14,912	468	97%	
	Test Cycle -4	Test Cycle -8	14,684	941	94%	
TOTALS:		**FC-Employee**	**56,440**	**3,023**	**95%**	8%
Food Prep Counter-Area 1	Test Cycle -1	Test Cycle -5	13,516	1,153	91%	
	Test Cycle -2	Test Cycle -6	31,370	2,905	91%	
	Test Cycle -3	Test Cycle -7	8,026	536	93%	
	Test Cycle -4	Test Cycle -8	17,504	1,688	90%	
TOTALS:		**FP Area 1**	**70,416**	**6,282**	**91%**	1%
Food Prep Counter-Area 2	Test Cycle -1	Test Cycle -5	10,061	1,810	82%	
	Test Cycle -2	Test Cycle -6	24,430	3,220	87%	
	Test Cycle -3	Test Cycle -7	8,763	312	96%	
	Test Cycle -4	Test Cycle -8	97,702	4,401	95%	
TOTALS:		**FP Area 2**	**140,955**	**9,743**	**93%**	7%
Produce Slicer Collect Board	Test Cycle -1	Test Cycle -5	170,394	615	100%	
	Test Cycle -2	Test Cycle -6	1,451	161	89%	
	Test Cycle -3	Test Cycle -7	1,811	192	89%	
	Test Cycle -4	Test Cycle -8	27,627	465	98%	
TOTALS:		**Collect Board**	**201,284**	**1,432**	**99%**	6%
Produce Slicer Blades	Test Cycle -1	Test Cycle -5	118,122	666	99%	
	Test Cycle -2	Test Cycle -6	2,629	579	78%	
	Test Cycle -3	Test Cycle -7	2,548	263	90%	
	Test Cycle -4	Test Cycle -8	59,819	982	98%	
TOTALS:		**Slicer Blades**	**183,118**	**2,489**	**99%**	10%
Totals for all sites	Test Cycle -1	Test Cycle -5	365,345	8,643	98%	
	Test Cycle -2	Test Cycle -6	129,881	10,789	92%	
	Test Cycle -3	Test Cycle -7	72,645	2,804	96%	
	Test Cycle -4	Test Cycle -8	265,457	11,043	96%	
TOTALS - All Non-Beverage Test Points			**833,328**	**33,278**	**96%**	**3%**

Table 3 – Average ATP Readings (RLU) from 8 Test Cycles at 6 Restaurants – Beverage Nozzles								
TOTALS ALL TEAMS AND RESTAURANTS Average ATP reading per test cycle per Store								
Test Points	**QUAT**	**PURE Hard Surface**	**% Reduction using PURE**		Test Points	**QUAT**	**PURE Hard Surface**	**% Reduction using PURE**
NOZZLES - EXTERNAL					***NOZZLES - INTERNAL***			
Nozzle 1					***Nozzle 1***			
Test Cycle -1	11,510				*Test Cycle -1*	199,135		
Test Cycle -2	35,227				*Test Cycle -2*	25,200		
Test Cycle -3	55,061				*Test Cycle -3*	123,604		
Test Cycle -4	80,348				*Test Cycle -4*	158,913		
Test Cycle -5	13,283				*Test Cycle -5*	308,306		
Test Cycle -6		1,910			*Test Cycle -6*		1,023	
Test Cycle -7		1,171			*Test Cycle -7*		751	
Test Cycle -8		2,354			*Test Cycle -8*		6,925	
Nozzle 1 TOTALS	**195,429**	**5,435**	**97%**		***Nozzle 1 TOTALS***	**815,158**	**8,699**	**99%**
Nozzle 2					***Nozzle 2***			
Test Cycle -1	15,507				*Test Cycle -1*	111,225		
Test Cycle -2	42,287				*Test Cycle -2*	16,983		
Test Cycle -3	16,452				*Test Cycle -3*	61,158		
Test Cycle -4	18,565				*Test Cycle -4*	49,936		
Test Cycle -5	20,568				*Test Cycle -5*	349,675		
Test Cycle -6		1,803			*Test Cycle -6*		9,828	
Test Cycle -7		828			*Test Cycle -7*		1,789	
Test Cycle -8		13,725			*Test Cycle -8*		9,542	
Nozzle 2 TOTALS	**113,379**	**16,356**	**86%**		***Nozzle 2 TOTALS -***	**588,977**	**21,159**	**96%**
Nozzle 3					***Nozzle 3***			
Test Cycle -1	65,257				*Test Cycle -1*	306,007		
Test Cycle -2	214,370				*Test Cycle -2*	82,413		
Test Cycle -3	34,177				*Test Cycle -3*	119,199		
Test Cycle -4	85,182				*Test Cycle -4*	50,772		
Test Cycle -5	50,306				*Test Cycle -5*	239,736		
Test Cycle -6		1,717			*Test Cycle -6*		3,077	
Test Cycle -7		1,445			Test Cycle -7		3,417	
Test Cycle -8		1,932			*Test Cycle -8*		2,234	
Nozzle 3 TOTALS	**449,292**	**5,094**	**99%**		***Nozzle 3 TOTALS -***	**798,127**	**8,728**	**99%**
Nozzle 4					***Nozzle 4***			
Test Cycle -1	22,143				*Test Cycle -1*	57,542		
Test Cycle -2	12,453				*Test Cycle -2*	23,134		
Test Cycle -3	25,674				*Test Cycle -3*	30,068		
Test Cycle -4	15,741				*Test Cycle -4*	10,933		
Test Cycle -5	38,757				*Test Cycle -5*	687,758		
Test Cycle -6		2,138			*Test Cycle -6*		845	
Test Cycle -7		1,567			*Test Cycle -7*		378	
Test Cycle -8		2,593			*Test Cycle -8*		8,133	
Nozzle 4TOTALS -	**114,768**	**6,298**	**95%**		***Nozzle 4 TOTALS -***	**809,435**	**9,356**	**99%**
TOTAL ALL EXTERNAL NOZZLES:	**872,868**	**33,183**	**96%±6%**		***TOTAL ALL INTERNAL NOZZLES:***	**3,011,697**	**47,942**	**98%±1%**

Table 4 – Average ATP Readings (RLU) from 8 test cycles at 6 Restaurants – Beverage Nozzles Immediately after Sanitization

TOTALS ALL TEAMS AND STORES

Average ATP reading per test cycle per Store

Test Points	***Average ATP REDUCTION – QUAT***	***Average ATP REDUCTION - PURE Hard Surface***	***% Reduction using PURE Hard Surface***
NOZZLES - EXTERNAL			
Nozzle 1			
Test Cycle -1 - INITIAL	11,510		
Test Cycle -1 -SANITIZED	4,655		60%
Test Cycle -5 - INITIAL		13,283	
Test Cycle -5 - SANITIZED		1,471	89%
REDUCTION - Nozzle 1 EXT	**6,855**	**11,812**	
Nozzle 2			
Test Cycle -1 - INITIAL	15,507		
Test Cycle -1 - SANITIZED	7,431		52%
Test Cycle -5 - INITIAL		20,568	
Test Cycle 6639 -		1,467	93%
TOTALS - Nozzle 2 EXT initial	**8,076**	**19,101**	
Nozzle 3			
Test Cycle -1 - INITIAL	65,257		
Test Cycle -1 - SANITIZED	64,873		1%
Test Cycle -5 - INITIAL		50,306	
Test Cycle 12352 - SANITIZED		851	98%
TOTALS - Nozzle 3 EXT initial	**384**	**49,455**	
Nozzle 4			
Test Cycle -1 - INITIAL	22,143		
Test Cycle -1 - SANITIZED	5,417		76%
Test Cycle -5 - INITIAL		38,757	
Test Cycle 851 - SANITIZED		14,796	62%
TOTALS - Nozzle 4 EXT initial	**16,726**	**23,961**	
TOTAL ALL EXTERNAL NOZZLES:	**32,041**	**104,329**	
Total ATP (RLUs) INITIAL	**114,417**	**122,914**	**226% GREATER NET REDUCTION using PHS**
Total ATP (RLUs) after Sanitization	**82,376**	**18,585**	
TOTAL ATP (RLUs) REDUCTION- All 4 Nozzles	**32,041**	**104,329**	
	28%	**85%**	

Test Points	***Average ATP REDUCTION QUAT***	***Average ATP REDUCTION - PURE Hard Surface***	***% Reduction using PURE Hard Surface***
NOZZLES - INTERNAL			
Nozzle 1			
Test Cycle -1 - INITIAL	199,135		
Test Cycle -1 - SANITIZED	98,740		50%
Test Cycle -5 - INITIAL		308,306	
Test Cycle -5 - SANITIZED		12,352	96%
TOTALS - Nozzle 1 INT initial	**100,395**	**295,954**	
Nozzle 2			
Test Cycle -1 - INITIAL	111,225		
Test Cycle -1 - SANITIZED	69,261		38%
Test Cycle -5 - INITIAL		349,675	
Test Cycle 6639 -		19,204	95%
TOTALS - Nozzle 2 INT initial	**41,964**	**330,471**	
Nozzle 3			
Test Cycle -1 - INITIAL	306,007		
Test Cycle -1 - SANITIZED	125,293		59%
Test Cycle -5 - INITIAL		239,736	
Test Cycle 12352 - SANITIZED		11,500	95%
TOTALS - Nozzle 3 INT initial	**180,714**	**228,236**	
Nozzle 4			
Test Cycle -1 - INITIAL	57,542		
Test Cycle -1 - SANITIZED	23,134		60%
Test Cycle -5 - INITIAL		687,758	
Test Cycle 851 - SANITIZED		4,411	99%
TOTALS - Nozzle 4 INT initial	**34,408**	**683,347**	
TOTAL ALL INTERNAL NOZZLES:	**357,481**	**1,538,008**	
Total ATP (RLUs) INITIAL	**673,909**	**1,585,475**	**330% GREATER NET REDUCTION using PHS**
Total ATP (RLUs) after Sanitization	**316,428**	**47,467**	
TOTAL ATP (RLUs) REDUCTION- All 4 Nozzles	**357,481**	**1,538,008**	
	53%	**97%**	

Table 5 - Average ATP Readings (RLU) from 8 Test Cycles at 6 Restaurants - ICE CHUTE					
			TOTALS ALL TEAMS AND STORES Average ATP reading per test cycle per Store		
Test Points			***Average ATP - QUAT***	***Average ATP - PURE Hard Surface***	***% Reduction PURE Hard Surface***
ICE Chute INT Left side	Test Cycle -1	Test Cycle -5	4,091	477	88%
	Test Cycle -2	Test Cycle -6	4,274	385	91%
	Test Cycle -3	Test Cycle -7	5,455	143	97%
	Test Cycle -4	Test Cycle -8	4,139	180	96%
		TOTALS – ICE Chute INT Left side	**17,958**	**1,185**	**93%**
ICE Chute INT Right side	Test Cycle -1	Test Cycle -5	2,063	227	89%
	Test Cycle -2	Test Cycle -6	10,014	519	95%
	Test Cycle -3	Test Cycle -7	4,806	84	98%
	Test Cycle -4	Test Cycle -8	1,998	332	83%
		TOTALS - ICE Chute INT Right side	**18,881**	**1,162**	**94%**
Total all Ice Chute Test Points	Test Cycle -1	Test Cycle -5	6,154	704	89%
	Test Cycle -2	Test Cycle -6	14,288	904	94%
	Test Cycle -3	Test Cycle -7	10,260	227	98%
	Test Cycle -4	Test Cycle -8	6,137	512	92%
		TOTALS - All Ice Chute Test Points	**36,839**	**2,347**	**94%**

Table 6 - Average ATP Readings (RLU) from 8 Test Cycles at 6 Restaurants - Produce Slicer					
			TOTAL ALL TEAMS AND STORES **Average ATP reading per test cycle per Store**		
Test Points			**Average ATP QUAT**	**Average ATP PURE Hard Surface**	**% Reduction using PURE Hard Surface**
Slicer Collect Board	Test Cycle -1	Test Cycle -5	170,394	615	100%
	Test Cycle -2	Test Cycle -6	1,451	161	89%
	Test Cycle -3	Test Cycle -7	1,811	192	89%
	Test Cycle -4	Test Cycle -8	27,627	465	98%
	TOTALS - Slicer Collect Board		**201,284**	**1,432**	**99%**
Slicer Blades	Test Cycle -1	Test Cycle -5	118,122	666	99%
	Test Cycle -2	Test Cycle -6	2,629	579	78%
	Test Cycle -3	Test Cycle -7	2,548	263	90%
	Test Cycle -4	Test Cycle -8	59,819	982	98%
	TOTALS - Slicer Blades		**183,118**	**2,489**	**99%**
Total all Slicer Test Points	Test Cycle -1	Test Cycle -5	288,517	1,281	100%
	Test Cycle -2	Test Cycle -6	4,080	739	82%
	Test Cycle -3	Test Cycle -7	4,359	454	90%
	Test Cycle -4	Test Cycle -8	87,446	1,447	98%
	TOTALS - All Slicer Test Points		**384,402**	**3,921**	**99%**

Table 7 – ATP Correlation to Microbial Analysis					
Test Site	**ATP (RLU)**	**Total APC (CFU)**	**Yeast (CFU)**	**Mold (CFU)**	**Total Micro (CFU)**
Produce Slicer 1	1,463	10,000	5,800	<10	15,800
Produce Slicer 2	1,106	100	<10	250	350
Food Prep. Table	32,841	300,000	1,700	2,200	303,900
Food Prep Counter	49,939	300,000	420,000	<10	720,000