ATP Hygiene Monitoring System Performance in the Presence of Acid Sanitizers

Purpose

In food safety, environmental monitoring plays a large role determining if cleaning processes are effective enough. ATP hygiene monitoring is a rapid and reliable tool to quickly monitor the environment post cleaning. Cleaning processes typically involve a cleaning step using a common detergent followed by sanitization of surfaces. ATP hygiene monitoring traditionally takes place before sanitization but in certain instances will take place after sanitizing. This study was conducted to determine any possible effects of various acid-based sanitizers on the performance of Hygiena's ATP hygiene monitoring system.

Materials

- EnSURE™ Touch Luminometer
- US2020 UltraSnap™ ATP swabs
- SUS3000 SuperSnap™ ATP swabs
- BioThema 10nM ATP Standard

Background Information Regarding Sanitizer Effects

When hygiene monitoring is implemented in a facility, the setting of thresholds is very important. These are usually set after a cleaning regime has been completed. The threshold is usually low and a reflection of the cleaning efficiency on that day. This threshold, once set, is the bar by which the future cleaning processes are monitored. Historical data has always shown that once thresholds are correctly set the cleaning improves with the subsequent data sets collected being mainly below this threshold level. Statistically, 75% or more of the future results will be less than the threshold (PASS) and 25% or less will be above the threshold (FAILS) and distributed randomly along the entire RLU range of the system used.

This distribution has two important strengths. First, it clearly shows that the results that are clustered below the threshold and are not influenced by the introduction of inhibitors such as sanitizers or inefficient swabbing. Second, the effect of inhibition on the FAILS is also important to understand; only those FAILS that are close to the threshold can be adversely affected, with the dynamic range being so large above a threshold that the likelihood of many FAILS being converted to PASS levels is minimized by the random scatter above the threshold of these FAILS.

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Methods

Direct Bioluminescent Inhibition

In this study each sanitizer was used according to the recommended concentrations for sanitizing food contact surfaces. 10 µL of each sanitizer, or water used as a control, was added to the swab bud of each device followed by 10 µL of a 5 nM ATP solution. Devices were activated and read according to instructions. Five replicates were performed. The RLU sanitizer test results were divided by the results of the control and multiplied by 100 to determine the relative activity.

Surface Swabbing

In this study five replicate 4" x 4" stainless-steel coupons were prepared for each sanitizer. 100 µL of working strength sanitizer were added to each surface and spread using a sterile L-shape spreader. Exposure time was based on sanitizer recommendations. After exposure, 100 µL of 10 nM ATP standard was applied to each surface, spread, and allowed to dry (2 hr). Control surfaces were spread with water instead of sanitizers. Each surface was swabbed and read. The RLU sanitizer test results were divided by the results of the control and multiplied by 100 to determine the relative activity.

Results and Discussion

Table 1 shows the impact of each sanitizer on the ability to measure ATP in the presence of each sanitizer when directly added to an ATP swab. As can be seen, none of the sanitizers drastically impacted the ability of the ATP swab to detect ATP. Activity ranged between 70 - 118% for each of the ATP swabs and sanitizers.

Table 2 shows the impact of each sanitizer on the ability to accurately measure ATP when sampled from a stainless-steel surface. As shown, none of the sanitizers drastically impacted the ability of each ATP swab to measure ATP from a surface where sanitizer had been applied. Activity ranged between 50 - 103% for each of the ATP swabs and sanitizers.

Table 1. Direct Addition to Swabs: Biolouminescent Activity Impacts

Sanitizer*	Concentration	Activity-Interference
Oxonia Active™	0.20%	74 - 116%
Vortexx™	0.20%	91 - 98%
Mandate™ Plus	0.19%	70 - 100%
Synergex™	0.20%	86 - 99%

*Oxonia, Vortexx, Mandate Plus, and Synergex are registered trademarks of Ecolab®

Table 2. Stainless Steel Surface Swabbing: Bioluminescent Activity Impacts

Sanitizer	Concentration	ATP Swab	ATP Control (RLU)**	ATP w/ Sanitizer (RLU)**	Activity-Interference
Oxonia Active - Peroxyacetic acid Sanitizer	0.20%	UltraSnap	498	487	98% - No Interference
		SuperSnap	981	992	101% - No Interference
Sanitizer	**Concentration**	**ATP Swab**	**ATP Control (RLU)**	**ATP w/ Sanitizer (RLU)**	**Activity-Interference**
Vortexx - Peroxyacid / organic acid sanitizer	0.20%	UltraSnap	498	455	91% - No Interference
		SuperSnap	981	904	92% - No Interference
Sanitizer	**Concentration**	**ATP Swab**	**ATP Control (RLU)**	**ATP w/ Sanitizer (RLU)**	**Activity-Interference**
Mandate Plus - Acid sanitizer	0.19%	UltraSnap	498	250	50% - No Interference
		SuperSnap	981	658	67% - No Interference
Sanitizer	**Concentration**	**ATP Swab**	**ATP Control (RLU)**	**ATP w/ Sanitizer (RLU)**	**Activity-Interference**
Synergex - Mixed peracid-based	0.20%	UltraSnap	498	412	83% - No Interference
		SuperSnap	981	915	93% - No Interference

**N=5 replicates; Average RLUs reported with 1000 fmol ATP applied per surface tested

Discussion and Conclusions

Results of this study showed that Hygiena swabs were relatively unaffected by the acid-based sanitizers evaluated. Minimal interference was seen for only the Mandate Plus sanitizer. However, any impact would not be enough to provide inaccurate results when determining if a surface was clean or dirty. Using ATP Hygiena monitoring devices to monitor surface cleanliness post sanitization is an appropriate application when acid-based sanitizers are used as directed.

The distribution of most of the PASS RLU levels being low and below the threshold level and the minority of the FAIL RLUs being randomly distributed above the threshold means that sanitizer inhibition would have very little impact on cleaning verification.

The effect of sanitizers should be viewed holistically as to how they affect the data population rather than individual results.