Environmental surfaces study in healthcare patient rooms using rapid ATP testing

University of Minnesota Medical Center Fairview

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Introduction

Secondary infections in hospitals are often due to unclean surfaces or poor cleaning practices in patient rooms. These can be very harmful to patients and costly to hospitals and clinics. By using adenosine triphosphate (ATP) bioluminescent as a indicator of contamination, one can rapidly check how well a surface has been cleaned. ATP is an appropriate marker for this type of testing because it is a compound found in all living organisms, and combined with the firefly enzyme (luciferase) and cofactor luciferin it converts chemical energy into light. Previous studies done in healthcare settings have suggested that surfaces with readings of 500 relative light units (RLUs) or less pass cleanliness standards, and more than 500 RLUs is unclean.

Higher RLU values → Increased ATP Content → Microorganisms Hand Contact

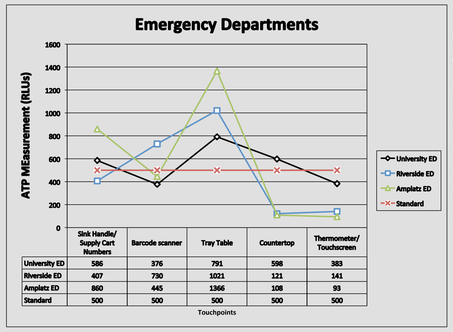
Methods

All samples were collected from the University of Minnesota Medical Center and Fairview Riverside. Over 500 samples were collected from patient rooms using 3M swabs. Surfaces included keyboards, trays, thermometers, barcode scanners, and other high-touch surfaces. The presence of ATP was detected using the 3M™ Clean Trace™ Luminometer. Samples were taken from the following locations:

- Operating Rooms (University, Riverside, Sports Clinic, Birthplace)
- Emergency Departments (Amplatz, University, Riverside)
- Dialysis (University, Amplatz)

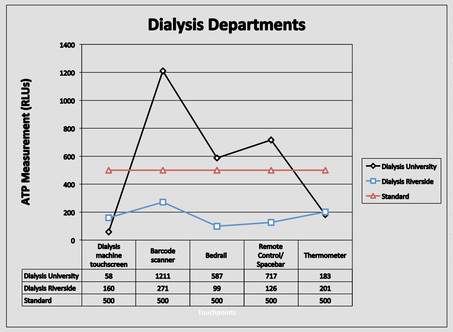
In ED's and Dialysis, samples were taken from occupied rooms followed by discharged rooms. In the OR's, samples were only taken from cleaned rooms.

Results



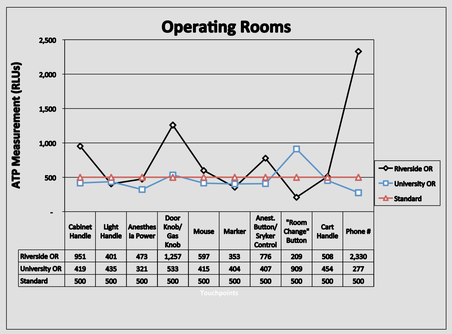
	Sink Handle/ Supply Cart Numbers	Barcode scanner	Tray Table	Countertop	Thermometer/ Touchscreen
University ED	586	376	791	598	383
Riverside ED	407	730	1021	121	141
Amplatz ED	860	445	1366	108	93
Standard	500	500	500	500	500

Figure 1. This graph represents the average measured RLU values from ATP samples at the five different touch points taken in each Emergency Department. 500 RLUs is the standard pass/ fail value used (Griffith, 2007). Samples were collected from ten rooms in each of the departments.



	Dialysis machine touchscreen	Barcode scanner	Bedrail	Remote Control/ Spacebar	Thermometer
Dialysis University	58	1211	587	717	183
Dialysis Riverside	160	271	99	126	201
Standard	500	500	500	500	500

Figure 2. This graph represents the average measured RLU values from ATP samples at the five different touch points taken in each of the two Dialysis departments. 500 RLUs is the standard pass/fail value used (Griffith, 2007). Samples were collected from seven rooms at the University department and ten rooms at Riverside (Amplatz) department.



	Cabinet Handle	Light Handle	Anesthesia Power	Door Knob/ Gas Knob	Mouse	Marker	Anest. Button/ Sryker Control	"Room Change" Button	Cart Handle	Phone #
Riverside OR	951	401	473	1,257	597	353	776	209	508	2,330
University OR	419	435	321	533	415	404	407	909	454	277
Standard	500	500	500	500	500	500	500	500	500	500

Figure 3. This graph represents the average measured RLU values from ATP samples at the five different touch points taken in each of the two Operating Room departments. 500 RLUs is the standard pass/fail value used (Griffith, 2007). Samples were collected from 7 rooms each of the two departments. Two of the touch points differed by department.

Average RLU Value

Department	ED	Dialysis	OR
Touchscreen	117	118	-
Thermometer	348	194	-
Mouse/ Spacebar	-	370	506

Table 1. This table is comparing similar touch points across different departments, on average. Devices with touchscreens and thermometers were measured at Emergency Departments and Dialysis; computer components were measured at Dialysis and Operating Rooms.

Conclusions

Sensitivity: ATP bioluminescence testing has the ability to detect if a surface is clean or unclean. However, this type of testing does not have the ability to detect what type of contamination is present, or if the uncleanliness is potentially harmful.

Real-time Monitoring: This method of testing holds a clear advantage over other contamination tests, because it can measure the amount of ATP on a surface in minutes. This feature alone makes it useful to hospital workers and infection prevention specialists.

Baseline: Although the baseline pass/fail value that I used was 500 RLUs (Griffin, 2007), other studies have suggested that >250 RLUs should be considered a unclean surface (Lewis, 2008). On average, 30% of touch-points failed in Dialysis, nearly 50% of touch-points failed in emergency departments, and about 40% of touch-points failed in operating rooms. Either the baseline has been set too low, or more likely, surfaces are not being cleaned effectively enough.

Opportunities: Given that all samples were collected from clean rooms, this suggests that high RLU values are the result of poor cleaning techniques, or that surfaces were re-contaminated by hospital staff after the post-discharge clean. This type of testing can allow healthcare workers to monitor at what point surfaces are being contaminated, because one could test immediately following room cleaning and immediately before a patient is admitted.

Future Studies:

- Compare other types of rapid contamination tests – including visual tests where Dazo gel is left on a surface to track what is removed from the surface.
- Continue to monitor results from these tests and establish a solid baseline pass/fail value. This value will most likely vary by department or type of healthcare facility.
- Continue quality improvement for infection prevention.

Literature Cited

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