Environmental surfaces and shared noncritical care equipment in hospitals may serve as reservoirs for pathogens. Assessment of the cleanliness of the patient care environment and equipment may identify deficits in cleaning effectiveness and opportunities to reduce the risk of HAI.

Adenosine triphosphate (ATP) luminescence technology is increasingly used in hospitals to monitor the cleanliness of the patient care environment. ATP luminescence technology measures the amount of organic material on a surface as a proxy for overall cleanliness.

Manufacturer recommended cut-off values are used to determine if a surface “passes” or “fails” a cleanliness test; however, microbiological data to support these cut-off values are limited.

OBJECTIVES

- To examine the relationship between ATP concentration and bacterial burden on environmental surfaces in the hospital.
- To generate local data to support educational efforts related to environmental cleaning and disinfection in hospitals.

METHODS

- From 11/2015 to 3/2016, 5 environmental surfaces in occupied patient rooms and other patient care areas were sampled using two techniques:
  1. ATP burden: The 3M CleanTrace Clinical Hygiene Monitoring System was used to quantify surface ATP concentration in “Relative Light Units” or RLU. The manufacturer recommended cut-off value for a “clean” surface was ≤ 250 RLU.
  2. Bacterial burden: BD BBL™ Rodac contact plates were used to quantify bacterial concentration in colony forming units (CFU) per cm².
- To capture a range of contamination levels, each surface was first sampled with a CleanTrace swab to assess the RLU value to ensure ≥20 samples in each of these ranges were collected:
  
<table>
<thead>
<tr>
<th>RLU Range</th>
<th>Sample Number</th>
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<tbody>
<tr>
<td>0-125 RLU</td>
<td>251-500 RLU</td>
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<tr>
<td>501-1,000 RLU</td>
<td>&gt;1,000 RLU</td>
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</tbody>
</table>
- To capture a range of contamination levels, each surface was first sampled with a CleanTrace swab to assess the RLU value to ensure ≥20 samples in each of these ranges were collected:

Sampling:
- CleanTrace swabs were rolled over 16 inches² of the surface and were immediately tested.
- Rodac plates were gently placed on each surface for 30 seconds, lifted perpendicularly off the surface, and immediately covered. Plates were incubated for 48 hours at 37 degrees Celsius before colony counts were completed.
- Rodac contact plates with >200 CFU were considered too numerous to count and recorded as 200 CFU for analysis.

RESULTS

- 98 surfaces were sampled in 4 inpatient units at an acute care hospital in New York, NY. Of the 98 surfaces, 37 were in occupied patient rooms.
- Samples: nursing station countertop (n = 28), glucometer (n = 19), overhead table (n = 19), mobile computer (n = 8), visitor chair (n = 9), and toilet seat (n = 9).
- The median RLU value was 373 (13-139,021) and median CFU count was 0.7 colonies per cm² (0-7.8).

CONCLUSIONS

- While ATP luminescence technology monitoring is not equivalent to microbiologic testing of environmental surfaces:
  - A correlation exists between RLU and CFU.
  - This analysis generally supports the manufacturer recommended cut-off values, demonstrating reasonable high sensitivity but rather low specificity for the presence of viable bacteria on surfaces at these values.
- Given its ease and ability to provide real time data, ATP luminescence technology may serve as a useful proxy for microbial contamination in the hospital environment; however, more accurate methods for assessment of environmental cleaning practices are needed and more data on the clinical significance of bacterial pathogenicity would be helpful.

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