Measuring cleanliness to deliver improvement

The detection of invisible contamination in the near patient environment can help to improve standards of cleanliness by giving an indication of cleaning effectiveness and acting as a tool for training and education of healthcare staff. *The Clinical Services Journal* reports.

It is widely recognised that infection prevention and control is multifactorial, and that the patient environment is a source and reservoir of contamination. A wide variety of equipment is routinely used during the delivery of healthcare and much of it – such as blood-pressure cuffs, commodes, bedpans and pressure-relieving mattresses – are used for multiple patients.

The cost of cleaning across the NHS amounts to hundreds of millions of pounds every year, of which most is attributable to labour costs. It is a process that, even today, relies almost entirely on the visual assessment of cleanliness – which is recognised as being of 'questionable value'. Carling and Bartley,[1] for example, found that 89% of hospitals use visual assessment of cleaning that can only detect gross lapses in practice. Only 34%-40% of surfaces are actually cleaned in accordance with hospital policies. They also found that monitoring and interventions can improve the thoroughness of cleaning from 40% to 82%. Effective cleaning can save £56,000 per ward per annum.[2]

Substantial savings in productivity and effectiveness can be gained by optimising and prioritising the use of available cleaning resources. Objective methods of detection are required for effective inspection. Rapid test systems, such as the use of adenosine triphosphate (ATP) bioluminescence, can provide instant information to enable immediate corrective action and the reduction of risk while providing meaningful quantitative information for management purposes.

ATP is the universal energy molecule found in all living cells. The combination of ATP with the enzyme luciferase produces light that can be measured in a luminometer. The amount of light is proportional to the amount of ATP and is expressed in RLUs. The greater the level of ATP, the higher the RLU value, and the dirtier the object being tested.

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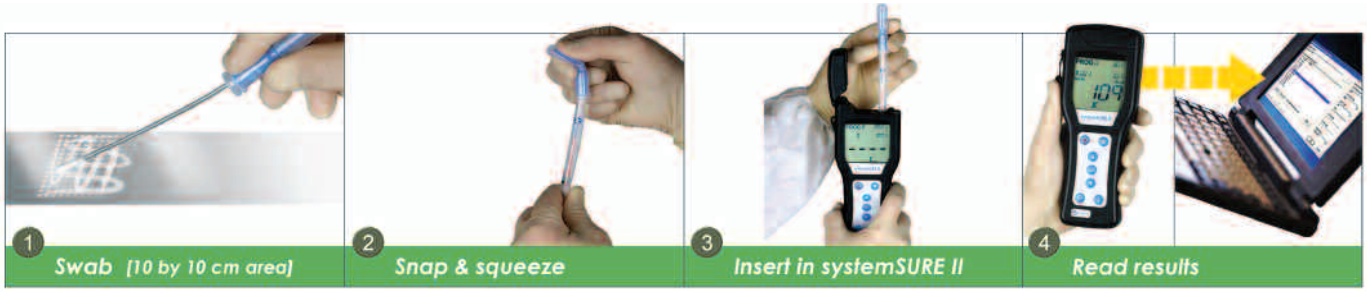
The ATP test has a variety of applications in the healthcare environment, including cleaning verification, hygiene monitoring, and training within housekeeping and infection prevention teams.[3-5]

Indeed, the revised NHS Cleaning Manual and the Rapid Review Panel recognise the potential role of objective methods of cleaning assessment using ATP bioluminescence, which is now a well established and proven technology.

The revised NHS Cleaning Manual[6] says that the effectiveness of ATP technology is well validated for the food industry, but evidence of its appropriateness for the different requirements of healthcare settings is not, as yet, extensive. It refers to an evaluation



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paper from the Department of Health (2007) *Evaluation of ATP bioluminescence swabbing as a monitoring and training tool for effective hospital cleaning* which concluded that ATP bioluminescence swabbing is a useful indicator of cleanliness in a hospital environment, and may also be useful as an educational tool.

The revised NHS Cleaning Manual concluded that there is evidence that ATP cleaning monitors can give an objective measure of how contaminated a surface is, which could indicate how effectively the surface has been cleaned. It recommended the use of ATP cleaning monitors, in addition to existing visual inspection monitoring, to give an indication of the relative performance of cleaning over time using a well planned approach, with consistent sampling points and intervals between tests.

Figure 1 and 2: House keeping trends at two acute hospitals.

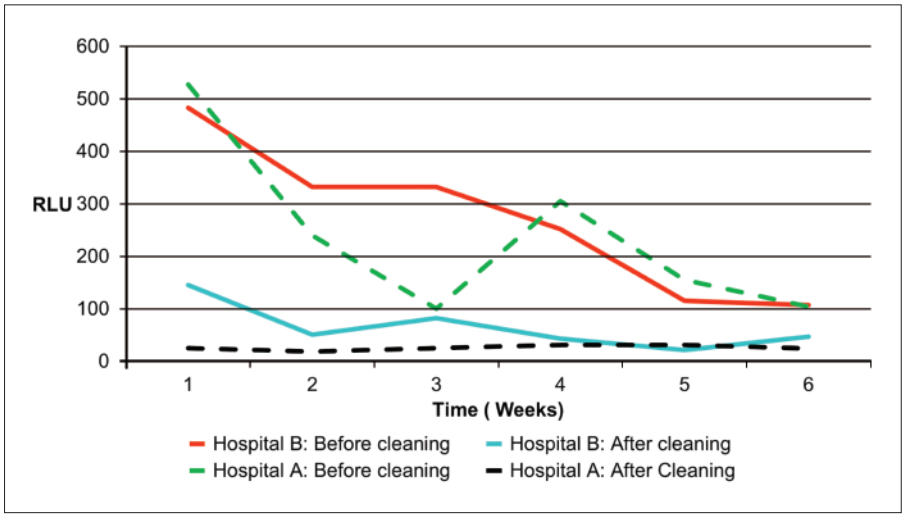


Figure 2.

Parameter	Hospital A First 3-week block	Hospital B First 3-week block	Hospital B Second 3-week block
Before Cleaning; Average RLU	271	340	158
Range	0-4959	3-4846	3-1861
After cleaning; Average RLU	23	93	37
Range	0-152	0-2621 (2 very high results)	0-202
Decrease in contamination	92%	73%	77%
Pass (< 50 RLU)	91%	70%	77%
Caution (51 – 99 RLU)	9%	11%	13%
Fail (≥ 100 RLU)	0%	19%	10%
Cleaning improvement; Difference between wards	Before / After	Before / After	Before / After
	Ward 8 309 27	Ward 1 294 45	Ward 1 438 33
	Ward 11 135 21	ITU 194 75	ITU 242 56
	Ward 20 373 21	AMU 534 41	AMU 196 41

Cwm Taf trial

The infection control team at the Cwm Taf Health Board has conducted a trial to evaluate the use of ATP bioluminescence to provide a rapid objective measurement of cleanliness in the near patient environment of acute hospitals.

The team used the SystemSURE Plus ATP Hygiene Monitoring system from Hygiena International to collect and test samples from hand contact surfaces and patient equipment in three different wards in each of two separate acute hospitals within the Cwm Taff Health Board.

The SystemSURE Plus requires a swab to be taken of the region to be tested using a sampling device which is then inserted into a hand held instrument. The result is shown within seconds as a number and can be displayed as a simple Pass, Caution or Fail display on the instrument.

The trial saw housekeeping teams testing patient tables and wash room areas before and after cleaning in three week blocks over a period of several months. Sample test sites included wash basins, bin lids, toilet seats and flushes, as well as several door handles and push plates.

Infection prevention teams similarly tested patient equipment and near patient surfaces in the same wards and over a similar time frame. Sample test sites included nurses call buttons, bed frames, commode seats, bed pan shelves, IV machines, pulse oximeters, and BP machines.

The results from ATP measurements are expressed as RLUs which were analysed to determine the levels of background contamination on visibly clean surfaces before and after cleaning. They were also used to compare the effects of cleaning to establish a benchmark for clean surfaces, identify potential areas of concern and compare the results between wards and hospital to look at trends over time. The responses and feedback from users and cleaning staff was also collected.

Results

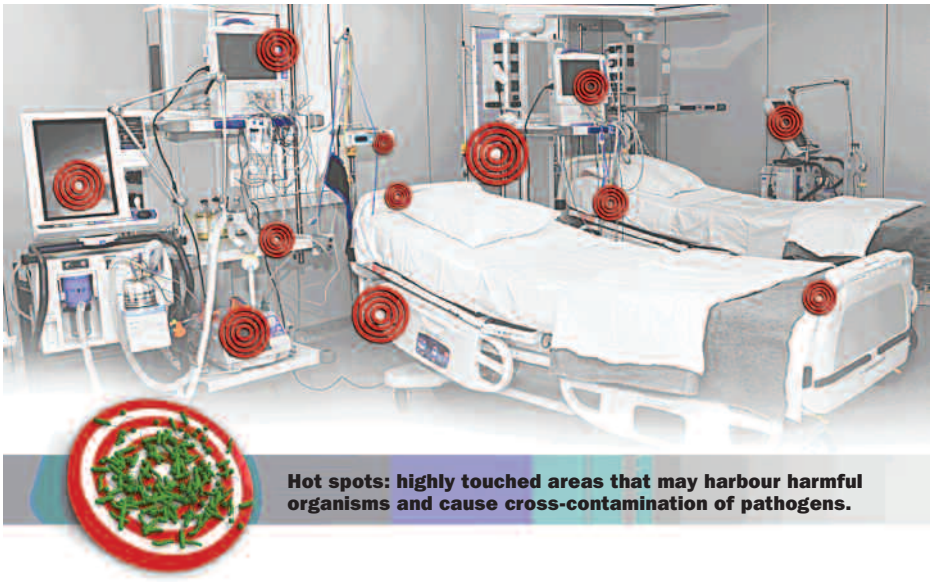
Figure 1 and 2 show results from the housekeeping teams.

Results before cleaning showed:

- A wide range of background contamination with ATP results of 0-4959.
- Average = 271 RLU. Wash basin and door handles were the highest.
- Ward 11 had 65% less background contamination – i.e. lower RLU results – compared to the other two wards which was consistent with an additional two hours of cleaning in ward 11.
- Background levels of contamination decreased with time while the ATP testing was conducted.

Results after cleaning showed:

- Lower and narrower range of contamination with ATP results of 0-152.
- Average = 23 RLU.
- 92% removal of contamination.
- Pass/Fail threshold values were calculated with 95% confidence limits at 50 and 100 RLU respectively.
- The benchmark of 100 RLU is consistent with other studies.[3,4]
- Classification of results using a traffic light system of Red/Amber/Green, or Pass/Caution/Fail showed no fails at benchmark i.e. 91% Pass and 9% Caution.
- Visual assessment of cleanliness only detected a small number of non-compliances, due to dusty surfaces (audit scores were typically >98%).



Hot spots: highly touched areas that may harbour harmful organisms and cause cross-contamination of pathogens.

Hospital B housekeeping team results showed similar background levels of contamination before cleaning but a higher average, at 340 RLU, and with considerable difference between wards. Post-cleaning ATP results of Hospital B housekeeping team also showed a greater range and a higher average compared to Hospital A. Residual contamination was higher, which was also reflected in the few number of Passes and greater number of Cautions and Fails at the benchmark level. Further improvement and reduction in ATP levels were shown in subsequent weeks testing following remedial action.

The infection prevention teams collected fewer test results which showed:

- Background levels of contamination before cleaning were lower than housekeeping team sample points.

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However, the most heavily contaminated sites were nurses call buttons, IV machines and pulse oximeters.

- The results after cleaning had a broader range than housekeeping teams although the averages were similar and below the benchmark.
- Hospital A had higher residual levels of contamination than Hospital B after cleaning, and a difference between wards was observed in Hospital B.
- Insufficient cleaning of some patient equipment (such as pulse oximeters) was identified and remedial action and training was implemented. Subsequent testing showed a marked improvement.

Trial conclusion

For Cwm Taf Health Board, ATP technology has provided objective quantitative measurement of cleanliness from which invisible contamination was detected, potential hazards were identified, a benchmark for cleanliness was verified and differences were detected between hospitals and wards that were previously unknown.

The data generated during the trial has also led to an improvement in the communication and understanding of cleanliness, engaged staff and provided positive reinforcement for best practice.

ATP technology can also be used to support training initiatives, and to prioritise and optimise use of cleaning resources for the Health Board, thereby improving safety and productivity and adding value.

Five years later

Early adopters of ATP monitoring systems in the healthcare field have shown the continuing benefits of ATP technology. With more than five years of regular monitoring and reporting history, North Tees and Hartlepool Hospitals have found major benefits from the implementation of Hygiena ATP monitoring solution, including improved cleanliness and lower infection rates. Data collected in a five year study at these two hospitals offers an example of the benefits that can be gained by adopting an ATP cleaning verification system.

Testing is routinely used throughout both hospitals to monitor cleanliness of patient rooms after terminal cleaning. It is also used to train cleaning staff and for hand hygiene training, to demonstrate effective hand-washing techniques. ATP monitoring results are also used as proof of cleaning staff performance.

To oversee monitoring, a project champion was assigned to each facility. This person is independent from nursing and environmental services staff and reports directly to department managers if corrective action is required. On a monthly basis, reports are produced and circulated in a cross-functional team meeting of nursing, facilities, and infection control staff. This meeting opens up discussion on all cleaning and maintenance related issues, as well as suggestions for improvement.

Data collected over the five-year period at North Tees Hospital shows an improvement of over 20% in Pass scores and also a reduction in Fail scores to fewer than 5%, reflecting a marked improvement in cleaning efficacy.

In the first year of testing, Hartlepool Hospital only achieved 50.36% Pass scores and 25.4% cleaning failures. By 2012, however, its Pass scores had improved by 19%, with 69.43% Pass scores. Fail scores decreased 9.48% in the same period.

In the same time frame, North Tees and Hartlepool Hospitals implemented additional measures to improve cleaning. These included:

- Deep cleaning protocols, including dedicated deep cleaning teams.
- Utilisation of dedicated decant facilities.
- Routine isolation cleans. Fogging after routine cleaning.
- Colour coding system.
- A dedicated hygienist staff member.
- Hand hygiene training and compliance monitoring.

Congregate data from the two hospitals reported 210 cases of hospital-acquired *C. difficile* infections between April 2007 and March 2008. After ATP monitoring and other interventions listed above were implemented, these cases were reported with less frequency in subsequent years. From 2008-2009, 158 *C. difficile* infections were reported. From 2009-2010, 136 infections were reported.

The data from North Tees and Hartlepool Hospitals illustrate the benefits of an ATP cleaning verification system, including improved hospital cleanliness; reduced hospital-acquired infections; optimised cleaning personnel training; objective cleaning staff performance management.

As of February 2013, Hygiena's ATP system continues to be an integral part of both North Tees and Hartlepool Hospitals' cleaning verification programmes. In addition to outstanding internal improvements, North Tees and Hartlepool's experiences have influenced the adoption of Hygiena's ATP cleaning verification system by Health Facilities Scotland (HFS), a guiding body of technical standards for all healthcare facilities in Scotland.

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'For Cwm Taf Health Board, ATP technology has provided objective quantitative measurement of cleanliness.'