

**Use of ATP as a tool for monitoring
cleanliness**
Report on visit to North Tees Hospital Trust
March 2011

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Background

The Department of Health's from deep clean to keep clean document (2008) highlighted a Which? Report published in 2007, which indicated that;

'One of the clearest signals to a patient that they will be cared for is the attention paid to the cleanliness of their wards and bathroom facilities.'

Patients and the public tend to use cleanliness as an indicator for general quality. (DOH; 2008). To ensure NHSScotland Healthcare Facilities are of a standard of cleanliness which optimises public and patient confidence, it is important that robust mechanisms in place to establish maintain and monitor cleanliness.

ATP bioluminescence is used extensively in the food industry as a tool for monitoring and maintaining cleanliness. There remains some debate around the ability of ATP bioluminescence to be used as a reliable cleanliness monitoring tool within healthcare premises, particularly as ATP is a measurement of organic matter rather than microbial contamination, and there is no direct link between ATP results, visual cleanliness and microbial contamination. In April 2009, Health Facilities Scotland's Domestic Services Advisory Group established a sub group to investigate ATP monitoring within NHSScotland.

The remit of this group was to:

- Undertake a review of existing literature relating to the use of ATP monitoring in a healthcare environment
- Consider the differences which exist between manufacturers ATP testing kits and recommend a minimum standard for this equipment when used to assess cleanliness standards within NHS Scotland.
- To investigate and set operational parameters appropriate for base line testing within the healthcare environment.
- To develop templates/protocols for the use of ATP monitoring in the healthcare cleaning environment, (including data collection methodology).
- To inform DSAG if ATP is a viable tool to be used within NHSScotland and in what format.

One output of the group was a study undertaken to ascertain if use of ATP monitoring was applicable, transferable and of benefit within the Scottish healthcare setting. The study would bring together visual, microbiological and ATP bioluminescence methods for assessing cleanliness of a hospital ward in order to determine whether these methods can be corroborated and integrated, and used as a future routine screening mechanism for assessing hospital cleanliness -. On conclusion of the study, a paper for publication was written and submitted to the Scottish Infection Research Network (SIRN) for review in

May 2010. Complimentary to this, the subgroup undertook to learn from other NHS Bodies who were using ATP Monitoring and share the knowledge. As an output of this, this report provides background to ATP bioluminescence monitoring reports on the ATP bioluminescence monitoring processes and protocols used at North Tees NHS Trust

Introduction

Environmental Contamination

Historically, the role of environmental cleaning in prevention of healthcare acquired infections (HAI) Hospitals has not been widely investigated (Dettenkoffer, 2004). Although the link between 'clean' healthcare facilities and HAI's is not clear and the precise role of cleaning in the control of infection remains unknown. (Dancer, 1999 as cited in Mulvey et al., 2011).

The role of contaminated environmental surfaces in the transmission of healthcare associate infection (HAI) pathogens is supported by evidence that environmental decontamination can reduce the incidence of HAI (Hota, 2004; Dancer, 2008; Sherlock, 2009)

Additionally, there is the public perception that visibly dirty healthcare facilities increase the risk of infection. As a result, the subject has come under more scrutiny in the last decade due to the increased reporting of HAI occurrence in patients (Dancer, 2008). Possibly due to this, Environmental decontamination is rapidly becoming a cornerstone of patient care, with hospital hygiene having an increasing media and public profile. (Carling, 2006; Griffith, 2007). This has led to pressure to ensure the cleanliness of facilities, and the publishing of cleanliness standards.

Methods of Evaluating Cleaning

Monitoring the efficacy of the environmental decontamination is an important component of the decontamination process (Sherlock, 2009). However in general the mechanisms for the evaluation of environmental cleanliness is limited and overall the current recommended tool for assessment is visual inspection (Sherlock, 2009; Dancer, 2008). Guidance produced by the (then) NHS Estates assesses cleanliness as a visual measure (NHS Estates, 2004), with its highest level being 'visibly clean'. A Visibly clean surfaces may fulfil aesthetic obligations & improve patient confidence but because it can still harbour harmful bacteria which are not visible to the naked eye; visual cleanliness is not necessarily related to increased protection from HAI's (Griffith et al. 2007, Dancer, 2004; Cooper et al. 2007) , it cannot predict the risk of infection for patients. (Dancer, 2004; as cited in Mulvey et al., 2011.).

Finding evidence which establishes the benefit from routine cleaning is difficult because there are no measurable standards. However, with increasing public and media anxiety relating to the perceived inadequacies in cleaning there is a need to establish a robust mechanism for the evaluation of hospital hygiene (DOH, 2008).

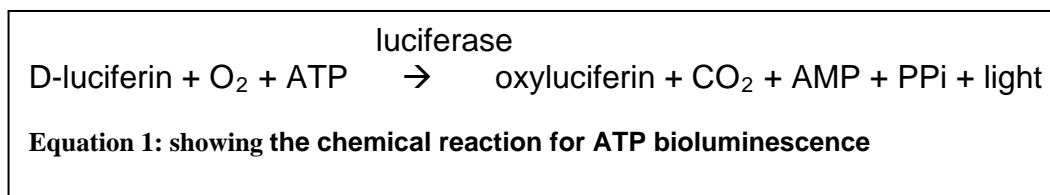
ATP

ATP (Adenosine triphosphate) is the basic energy component molecule of all plant and animal cells and is present in all microorganisms and organic

residues. Due to this, its presence on a substrate can be used as an indicator of organic soil, on that substrate.

Bioluminescence

When ATP reacts with luciferin in the presence of luciferase, as shown in equation 1, it produces a release of energy in the form of light, this is called bioluminescence. Therefore, presence of ATP can be detected as a light output using bioluminescence testing techniques.



Where AMP is adenosine mono-phosphate and PPi is inorganic pyrophosphate. A luminometer is used to measure the amount of light that is emitted from the sample. The measurement of a lumen is the measurement of how much light is being emitted from a source. Therefore the measurement of light intensity provides a visual indicator of total organic soil.

ATP systems use a detection swab to take a specimen from a particular surface. The swab is then inserted into a reader and a numeric reading is produced instantaneously

Due to this, Adenosine triphosphate (ATP) bioluminescence has been suggested as a useful tool for improving cleaning protocols, by providing an instantaneous demonstration on where organic soil remains after cleaning (Dancer, 2009, Griffith et al., 2007, Lewis et al., 2008, Aycicek et al. 2004). Instantaneous demonstration of organic soil has the potential to allow cleaning supervisors to demonstrate the impact of different cleaning protocols in the removal of organic soil, and demonstrate to cleaning staff the importance of following the correct procedure.

Monitoring for Adenosine triphosphate (ATP) bioluminescence is a method widely used within the catering field as an evaluation of surface cleanliness.

Several studies have been carried out to ascertain whether or not ATP bioluminescence monitoring could be transferred for use in the healthcare setting as an evaluation method for environmental decontamination. (Larson, 2003; Aycicek, 2005; Griffith 2007; Sherlock, 2009)

As part of the work of the Domestic Services Advisory Group (DSAG) Representatives from Health Facilities Scotland (HFS) Health Protection Scotland (HPS) and a DSAG member from NHS Greater Glasgow and Clyde visited North Tees NHS Trust on 22nd October 2010 to discuss the use of ATP

North Tees NHS Trust Visit

North Tees NHS Trust has been using ATP bioluminescence as a monitoring tool for over 2 years.

North Tees NHS Trust comprises of North Tees hospital and Hartlepool hospital. Overall there are 690 beds: 470 North Tees hospital, 220 Hartlepool hospital. Both healthcare facilities utilise ATP monitoring however, the main focus of the visit was North Tees hospital. The visit was facilitated by the Head of Operations for the Trust.

In addition to the use of ATP bioluminescence monitoring the Trust had introduced other measures to help address HAI related built environment issues. These included

- Deep Clean Programme
- Utilisation of dedicated Decant Facilities
- Routine isolation cleans
- Fogging
- Colour coding
- Hygienist
- Hand Hygiene

Deep clean

North Tees NHS Trust took part in The Deep Clean programme which was announced by the (then) Prime Minister in September 2007. NHS Trusts were encouraged to assess the current state of their hospital environments and identify areas that would benefit from a thorough deep clean, or refurbishment. Complimentary to the initial deep clean was undertaken North Tees NHS Trust has utilised a range of cleaning methods as part of the overall strategy in the reduction of HAI. As health is a devolved issue, this programme did not extend to NHS Scotland.

Deep Clean regime and the utilisation of decant facilities.

Following the implementation of the government deep clean programme in 2007/8 a decant ward has been established. This has allowed a rolling programme of deep cleaning and maintenance within the hospital. Every 6 to 12 months, each ward is transferred to the decant ward and the vacated ward is thoroughly cleaned by means of steam and fogging with hydrogen peroxide. Communal equipment is decontaminated by steam cleaning. During this time all maintenance & repair work are carried out. The maintenance budget for each ward is worked around the deep clean programme. In instances where the full ward cannot be decanted arrangements are made to deep clean on a bay by bay basis.

During this time the opportunity is taken to complete minor aesthetic estates maintenance issues which contribute significantly to the overall appearance of the ward, including painting, door maintenance, repair of walls, grouting.

Routine isolation cleans

Isolation cleaning within this NHS Trust is organism dependent.

If the organism is MRSA then a daily clean using general purpose neutral detergent is carried out. If the organism is *Clostridium difficile* a daily clean is performed using a hypochlorite solution. Vacuums are used in all isolation and terminal cleans which is a variation of arrangements in NHS Scotland where isolation rooms are cleaned using specific colour coded (yellow) cleaning equipments using an anti bacterial detergent solution, vacuuming is not carried out. All isolation cleans are carried out using disposable cloths and mops. Where none disposable equipment is used this is thoroughly cleaned following the isolation clean.

Fogging

Fogging has been in use for environmental decontamination since the 1950s. Microcondensation with hydrogen peroxide has been shown to eradicate MRSA and *Clostridium difficile* with some fogging systems being advocated for eradication of norovirus (Boyce et al., 2008) it is recognised however that fogging is not a substitute for thorough cleaning, which still needs to take place (Burnfoot et al., 1999).

The fogging system implemented in North Tees is a dry mist vapour fog. The trust utilises Fogging

- 6/12 monthly deep clean.
- Single room terminal clean
- Post outbreak/terminal clean

Prior to the commencement of the procedure a hypochlorite clean is performed. Once fogging has been carried out the room/area can be brought back into use after 90 minutes if the area is well ventilated. If, however, there is a lack of ventilation the room/area is left empty for 4 hours. In situations where fogging is unable to be carried out as method of terminal clean, a hypochlorite clean is performed, this is repeated 24 hours later, irrespective of whether the room/area has been brought back into use. Supplementary, to this Sporicidal wipes are also in use for the cleaning of communal equipment in use in the single room. All items are decontaminated with a sporicidal wipe after each use.

Colour coding

Each alert organism has been allocated its own colour code. When a patient is placed in isolation a colour coded sign is placed on the door of the room to alert staff to isolation precautions required. On the reverse of this laminated card are the specific cleaning instructions that are required. This includes daily cleaning instructions and terminal cleaning instructions

Change to mopping and sweeping of floors

Microfibre mops are not widely used within this NHS Trust although whenever they are used they are of the disposable rather than reusable nature. The preference is for Maslin mops as they have experienced a wider pick up compared to microfibre. Maslin cloths are linen impregnated with non greasy oil which provides better dust and debris uplift

For routine environmental decontamination, the ward areas are given a dry sweep twice daily. A wet mop is performed on alternate days with spillages being cleaned when they occur. Floor buffing is no longer a routine practice.

This level of cleaning varies significantly from the NHS Scotland National Cleaning Specification

ATP

Adenosine triphosphate (ATP) bioluminescence testing has been in use within this NHS Trust for over two years. Its introduction within the Trust has been utilised to help instil sustain and promote public confidence. It has also been used as an awareness raising tool for staff to indicate the importance of cleaning

Testing for ATP is routinely used for monitoring of cleanliness, training of domestic staff and as a process for performance management. There are clearly established pass, caution and fail rates.

Monitoring

During each monitoring process, 5 ATP swabs are taken to ensure the efficacy of the cleaning undertaken. These swabs are only ever taken from rooms that have been cleaned and no person has entered the room following the clean prior to the swabs being taken. This ensures no further human contamination of the room.

Training

ATP swabs are used in the domestic training process to indicate how effectively cleaning removes bio-contamination

Performance management

ATP scores are used to assess a domestic's performance with regards to assessing how effectively their cleaning is removing biocontaminants. On occasion where there has been concern raised over performance, the ATP monitoring results have been produced as evidence.

Rectification

If the ATP results indicate a caution or fail then a re-clean of the failed area is undertaken. If the swabs have been used on communal equipment, nursing management are informed of the fail to allow rectification to occur.

There is no documented rectification process currently in use.

Governance/Reporting

A mentoring report is produced monthly from the ATP results. This report is circulated to the cleaning group which is attended by nursing staff, facilities staff and infection control staff. Discussion occurs at this Group on all cleaning and maintenance related issues and how better communication can be established between Facilities and nursing staff. The reports are then forwarded to the infection control committee.

Cost

The current cost is £1 per swab. It is worthy of noting that when the monitors were initially purchased by the NHS Trust a large volume of swabs were also given to them by the company. This stock is now very low and there is currently a review being carried out into whether the same level of ATP monitoring will continue given the cost.

Other measures used by North Tees Trust

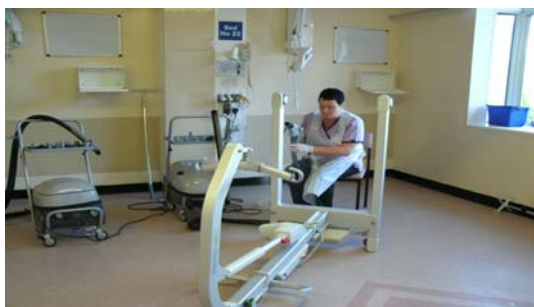
Hygienist

The NHS trust have employed hygienists whose main role and function is the decontamination of communal patient equipment.

The hygienists perform the steam cleaning of equipment from the ward which is closed for its routine deep clean (picture 1). It is also the hygienists who carry out the fogging of rooms during the deep clean and terminal cleans of rooms. They are supplemented by the Rapid Response Team or Floor Team who assist in discharge and terminal cleaning which does not require fogging to occur. During the deep cleaning the steam cleaning of communal equipment takes place within the empty ward area however, in addition there is a dedicated cleaning area where steam cleaning of equipment can be carried out (Picture 2). If a ward/area is aware of an increase in their rates of *Clostridium difficile* or MRSA then communal equipment is steam cleaned as part of the process to prevent any further cases.

There is a large stock of commodes and other patient equipment. This allows an exchange system and the commodes removed from the ward area are then steam cleaned and kept in the storage area, until the next exchange (Picture 3). An additional benefit that has evolved from this protocol is the ability to repair items such as commodes. If a commode is condemned by a ward/department, any reusable components are cleaned and stripped from the commode before it is scrapped. This allows the items to be repaired at no additional component costs.

Vacuums used by Domestic staff are fogged in the area on a weekly basis to ensure that *C. Diff.* spores are removed from these after it being found in some of the vacuums after cleaning



Picture 1.



Picture 2



Picture 3

Hand hygiene

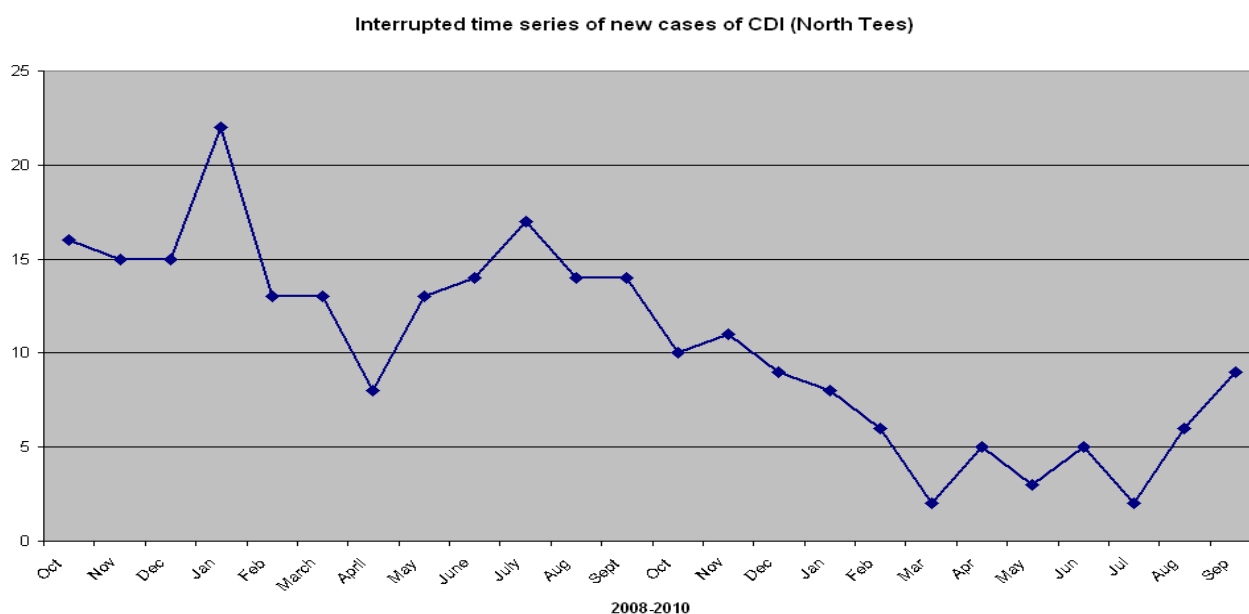
Whilst the purpose of this visit was not to comment on hand hygiene facilities, the approach to hand hygiene within this NHS Trust is remarkable. On entering the corridor to each ward there is an automated voice which reminds all entering of the importance of hand hygiene. There is a wash hand basin outside each ward. In addition there are numerous large posters relating to hand hygiene. On entering the ward area there is alcohol gel and posters and additional signage throughout the ward area, including the floor. During the visit the use of both wash hand basins and alcohol gel by every member of staff and visitors who entered the ward was witnessed.



Summary

During the visit to North Tees hospital, it was apparent to those who participated in the visit, that there was an integrated approach between healthcare staff and facilities teams towards hospital hygiene. Whilst the hospital is not a new build it was certainly visually clean and in a very good state of repair. The modern matrons within the wards appear to be very focussed on hospital hygiene and there was an aura of high staff morale.

The use of the decant ward and the deep clean programme has allowed remedial and refurbishment works and major cleaning works to be planned and carried out in an integrated manner rather than in a piecemeal fashion. Anecdotally, these integrated methods have been favoured by staff. This NHS Trust boast of a reduction in *Clostridium difficile* rates of 53% since the introduction of antimicrobial pharmacists and the 'cleaning based' measures described on page five of this report. This is illustrated in Graph 1, the extent to which changes to the cleaning regimes and introduction of ATP testing, have attributed to this can not be estimated .



Graph 1 indicating incidence of *C.difficile* infection in North Tees NHS trust

Discussion and conclusions:

ATP bioluminescence monitoring has been used in North Tees NHS Trust as a platform for promotion of hospital hygiene and as such is an effective tool, within this NHS Trust, in:

- establishing public confidence
- training of staff

- and monitoring of efficacy of cleaning processes

The system was not used in isolation and was part of a wide range of measures targeting decontamination of the environment and equipment; therefore it is difficult to quantify the direct impact the system had on the reduction of HAI's. Consequently, the findings from this visit suggest that ATP testing is useful as a tool for education and awareness raising amongst cleaning staff and promote public confidence in cleaning practices. The findings from the visit do not advocate the use of ATP as a stand alone measure of hospital hygiene.

It should be noted that using this technique incurs a financial cost and for this approach to be widely considered throughout NHSScotland as a training tool a cost benefit analysis would required to be undertaken.

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