The Antimicrobial Product Range Offering 'Hygiene for Life'

Toilet Partition Hardware & Washroom Accessories
Antimicrobial Protection in Hygiene Conscious Environments

Metlam's Antimicrobial Range of Commercial Washroom Accessories and Toilet Partition Hardware is the first choice for a more hygienic washroom.

Metlam has partnered with the international leader, BIOCOTE® to deliver our Antimicrobial Range which reduces the levels of bacteria, including MRSA and E. coli on a protected surface by up to 99.9%. Metlam's Antimicrobial Range is the ideal choice for Public Washrooms, Healthcare, Nursing Homes and School projects and is tested to ISO 22196:2011.

The antimicrobial product range offering 'Hygiene for Life'

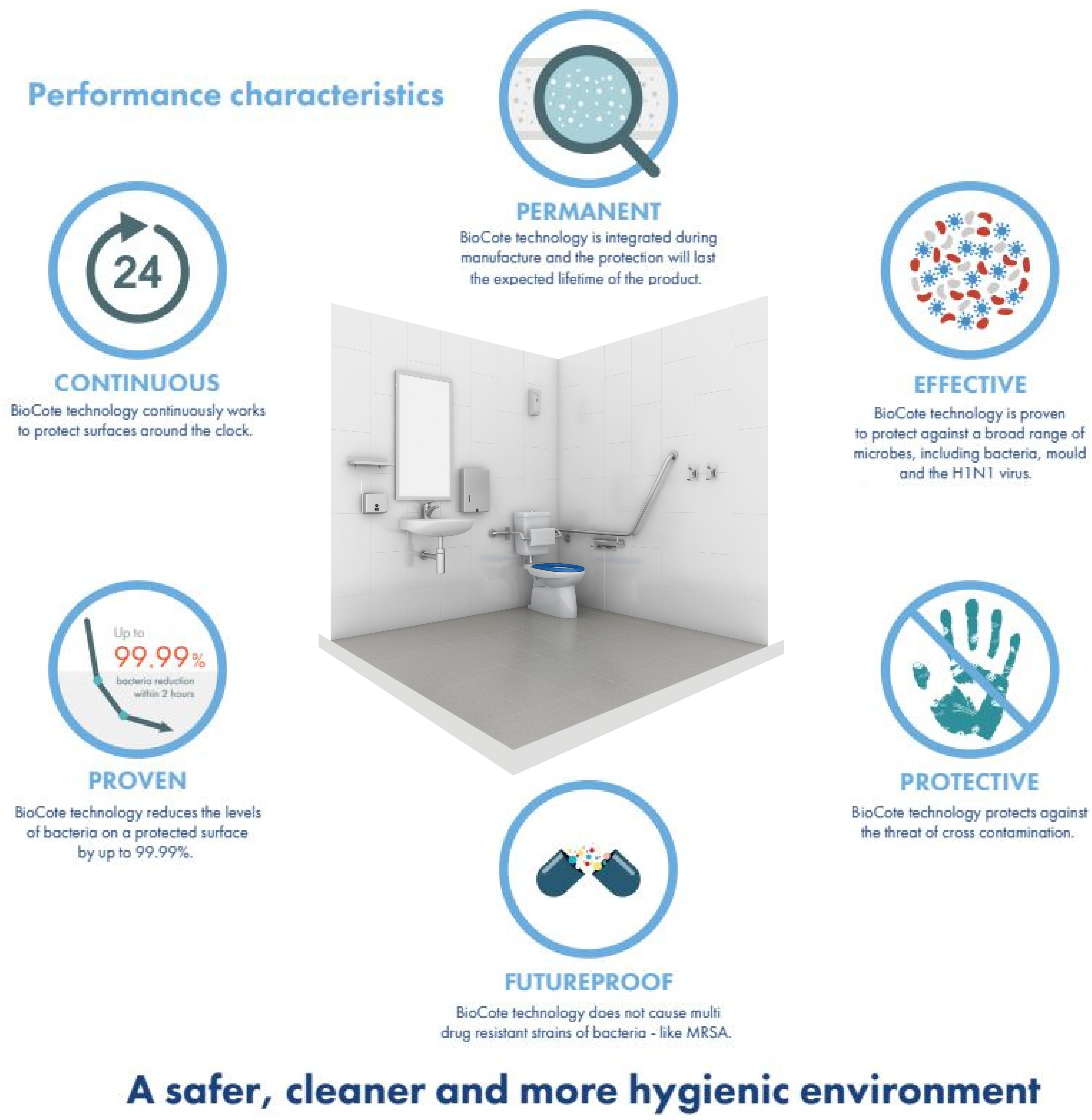
Our experienced manufacturing and service capabilities, combined with our partnership with Antimicrobial Pty Ltd - Licensed distributor of BioCote® technology, makes the Metlam antimicrobial product range the ideal choice in the market place.

Field tests prove that washroom equipment treated with BioCote coating benefits from up to 99.9% reduction in bacteria on their surface, helping create a cleaner and a more hygienic environment.

When micro-organisms come into contact with a BioCote protected surface their growth is inhibited, reducing microbial populations resulting in a more hygienic product.

BioCote antimicrobial technology is incorporated into Metlam's washroom accessories and toilet partition hardware products at the time of manufacture, offering constant protection against a wide range of microbes including all bacteria and the H1N1 influenza virus.

All of our antimicrobial products are independently certified for antimicrobial efficacy on a regular basis and can boast a rating of 99.9%.



Metlam Australia Pty Ltd T: 1300 METLAM E: sales@metlam.com.au www.metlam.com.au

METLAM AUSTRALIA

Advantages of BioCote Antimicrobial Technology

BioCote are the world's leading antimicrobial additive supplier. With over 20 years' experience, BioCote are experts in antimicrobial technology and are dedicated to helping businesses around the world create products that are more hygienic and protected against the negative effects of bacteria,mould and fungi. BioCote protected products are used and trusted by millions of people every day. Wherever you see the BioCote logo, superior antimicrobial performance is guaranteed.

BioCote. A sign of quality

The BioCote brand is recognised globally as a guarantee of superior antimicrobial performance. BioCote's proven technology sets the antimicrobial standard.

What does BioCote technology do?

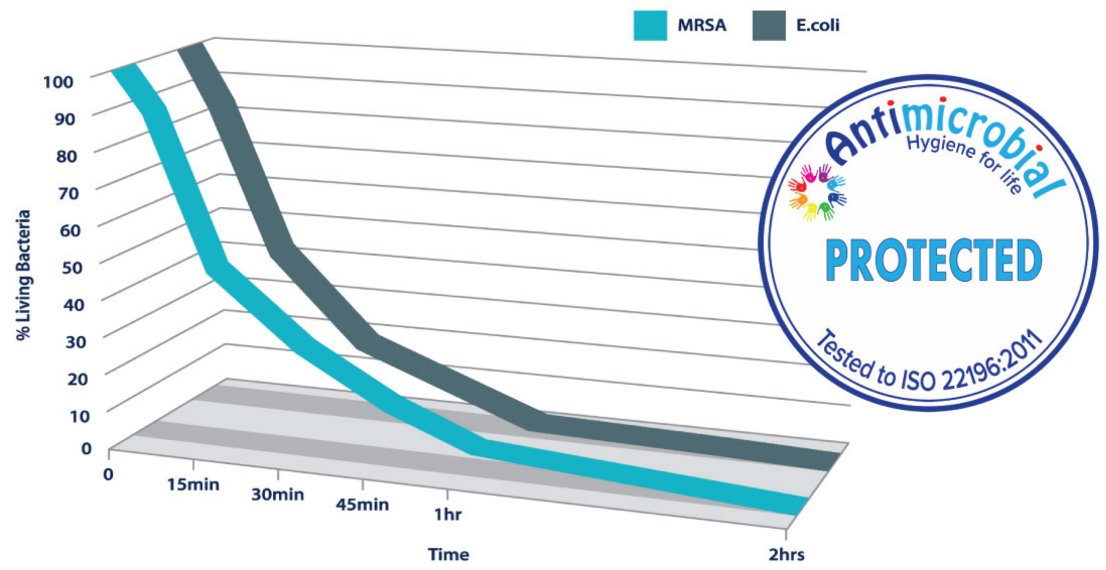
BioCote Technology makes your product antimicrobial, protecting it against bacteria and mould.

Your BioCote protected product is:

- more hygienic
- protected against stains
- protected against odours
- protected against material degradation
- easier to keep hygienically clean
- safer to use
- will last and perform longer

INDEPENDENTLY ACCREDITED

Metlam's antimicrobial range has been independently tested and certified against ISO 22196:2011 and provides an effective secondary support to existing cleaning regimes in the fight against contamination.
All Metlam antimicrobial coated products are identifiable by the Antimicrobial Pty Ltd protection seal



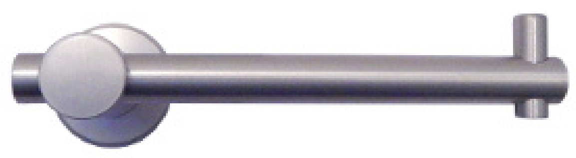
Level of microbes is reduced by up to 99.9% in two hours, with an 80% reduction in the first 15 minutes.

Introducing the Antimicrobial Range

To view the complete Antimicrobial Range visit www.metlam.com.au

MLR119C_VP_ANMB
Antimicrobial Vandal Proof Curved Backrest

ML951_400SHELF_ANMB
Antimicrobial Stainless Steel Utility Shelf

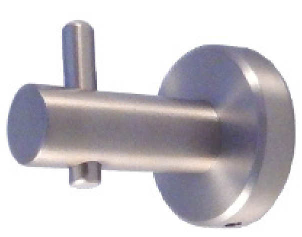


700_TRH_ANMB
Antimicrobial Single Toilet Roll Holder - Concealed Fix
Also available as a double

MODA_LOCK_ANMB
Antimicrobial Moda Lock and Indicator Set

ANMB_MLR112
Antimicrobial 90° Ambulant Grab Rail

ANMB_725AR
Antimicrobial Paper Towel Dispenser



700_ROBEHOOK_ANMB
Antimicrobial Robe Hook - Concealed Fix

MODA_HOOK_ANMB
Antimicrobial Moda Hat and Coat Hook

ANMB_ML327
Antimicrobial 300mm straight Grab Rail
Also available in
ANMB_ML330 - 450mm Straight Grab Rail
ANMB_ML331 - 600mm Straight Grab Rail
ANMB_ML332 - 750mm Straight Grab Rail
ANMB_ML333 - 900mm Straight Grab Rail

BioCote®

AIRFLOW AND IT'S MICROBIAL CONTAMINATION IN AN OFFICE ENVIRONMENT

Cross-contamination is well understood, yet the transmission of potentially harmful microbes by air movement is less well documented. BioCote's team of microbiologists looked to better understand the role of airflow in microbial contamination.

When we think about cross contamination we tend to think about microbes being transferred from person to person, person to surface contact or, of course, surface to person.

The role we play in the spreading of microbes is well understood and in some environments, such as healthcare, precautionary methods such as improved hand hygiene has played a significant role in the reduction of HAI's (Hospital Acquired Infections).

Awareness of this issue has also seeped into the public consciousness. How often do you see people using alcohol wipes or similar gels in public to sanitise their hand or surfaces they need to touch?

What has been less well documented, is the transmission of potentially harmful microbes by air movement.

BioCote's team of microbiologists, led by Dr. Michail Karavolos have recently carried out a study to better understand internal air quality and the role that air movement plays in the distribution of microbes within the workspace.

Surfaces were selected around the BioCote office, in a number of locations, with varying proximity to air-conditioning units, doors, thoroughfares, and windows. Settle plates, used to capture any microbes were placed in those locations for a period of two hours. The study separates into two sample sets:

Sample set 1:
Plates recovered - air conditioning turned OFF.

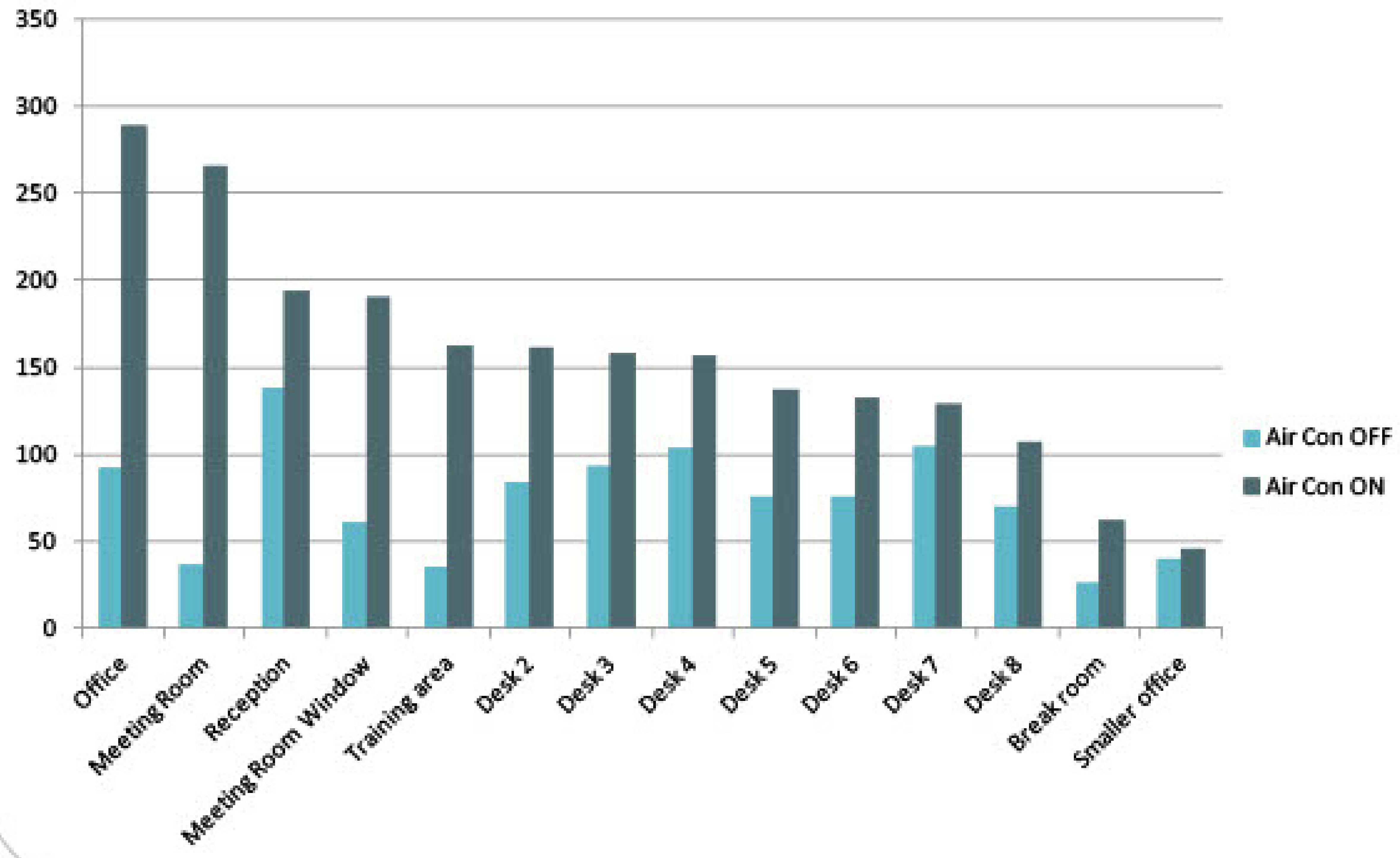
Sample set 2:
Plates recovered - air conditioning turned ON.

After collecting both sets of plates, they were incubated at 30°C for 48 hours to allow any microbes present the best conditions for growth.

Following incubation total colony forming units on the plates were counted. The results are shown on the next page.

RESULTS

FIGURE 1: TOTAL COLONY FORMING UNITS PER OFFICE ITEM



We can see from the results, every sampled surface demonstrated an increase in total microorganism count when the air conditioning was in action.

This was also the case in rooms which remained unoccupied during the sample period – reducing any likelihood additional microbes were being introduced or distributed by other means.

The detected microbes were predominantly fungi, organisms which would have been distributed as spores. We can therefore use the above results as a potential indicator (or model) for distribution of microbes in general within the environment.

These figures demonstrate that the air-conditioning or air movement played a role in increasing the number of microbes detected by the samples plates.

This is a good indication that the distribution of microbes in an environment can be effected by air-condition or air flow.

Either the additional microbes detected were released by the air conditioning or the subsequent air movement has redistributed microbes that already existed in the environment sampled, but which were not detected in part one of the test.

The idea that air-conditioning can impact the count of microorganisms on a surface could be considered a serious issue. Most buildings of whatever purpose are equipped with either air conditioning or heating systems that rely on convection, which itself increases air movement.

With the data generated we can begin to better understand the role air flow and movement can have in the ongoing passage of microbes within any environment. This in turn highlights the potential for microbes to colonise surfaces not usually considered susceptible to microbial contamination by other means – such as touch, and the role antimicrobial technology can play in mitigating this impact.

EVER WONDERED JUST HOW DIRTY IS A PUBLIC BATHROOM?

Public toilets are often judged to be unhygienic places, but does this perception match reality? We examine a public bathroom to find out.

Public bathrooms are often thought of as unhygienic places: high numbers of visitors – with varying awareness of the importance of personal hygiene, ineffectual or an absence of thorough cleaning and the purpose for which they are designed means that public toilets provide the perfect environment for microbes to thrive.

Does this idea match reality? Are public toilets really as unhygienic as we think?

Aim

The study looked to understand which items in a public toilet were the most contaminated with bacteria, and to answer the age-old question: is a public toilet really the dirtiest item of all?

Method

In order to compare the levels of bacteria on each item of interest in the bathroom, all items were swabbed to find out how much bacteria were living on them. This included the toilet, sink and flooring, as well as the radiator, tap, hand rail, toilet paper dispenser, side wall, waste bin, hand dryer, ceiling air vent, mirror and soap dispenser.

Following the swabbing of the items, the results were then processed in the laboratory and the bacteria recovered from each product was counted.

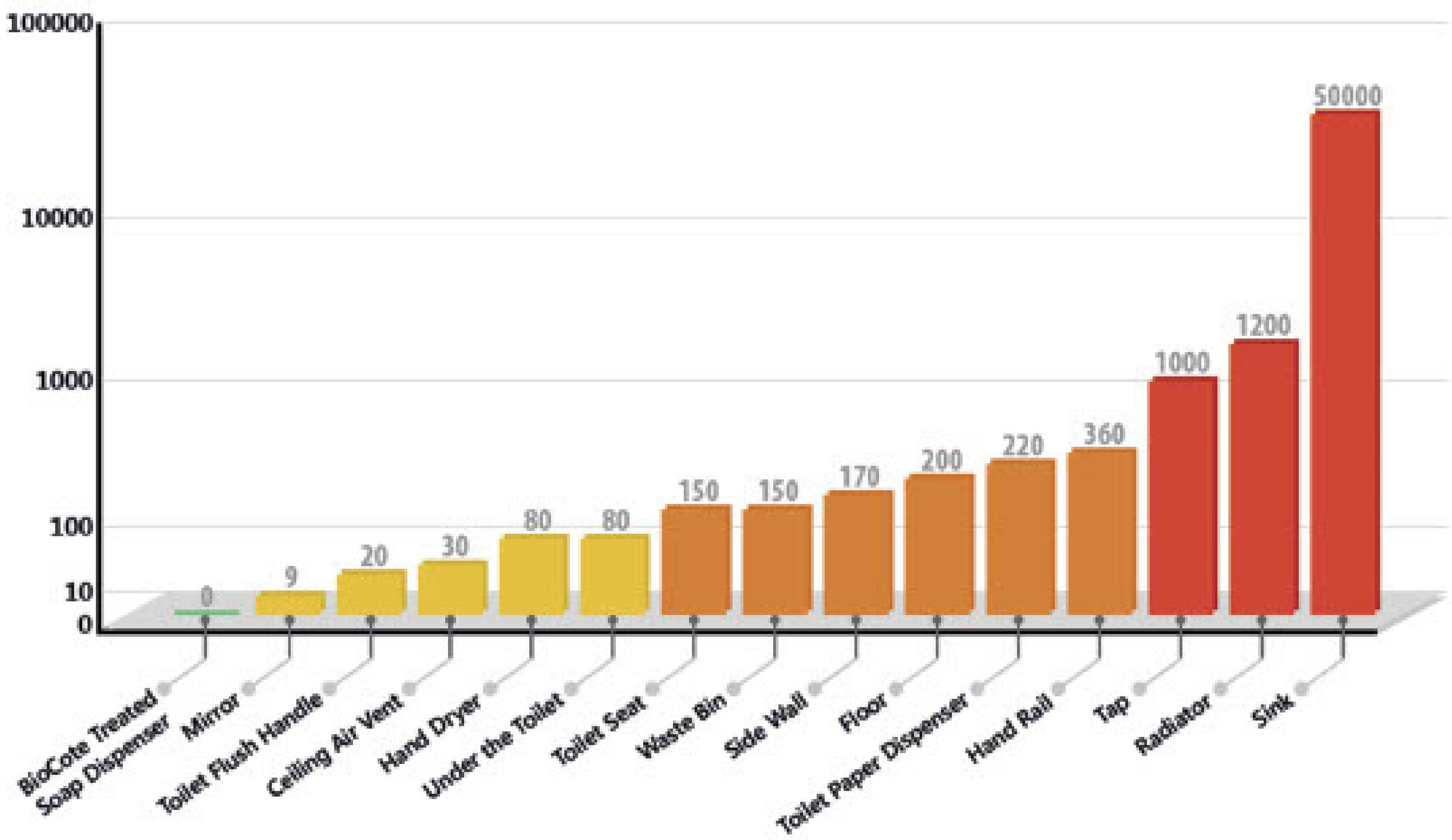
Results

The dirtiest item in the bathroom was not as you may expect. The most contaminated object in the bathroom was in fact the sink.

The object with no bacteria recovered on it was in fact the soap dispenser. This was also the only item to be protected with BioCote antimicrobial technology.

RESULTS

FIGURE 1: TOTAL COLONY FORMING UNITS PER ITEM IN THE BATHROOM



Conclusion

Our findings confirm the common perception that public toilets do harbour potentially high levels of bacteria. Additionally, the only item in the study to not contain any bacteria was the Deb soap dispenser. This finding is particularly interesting considering the dispenser is touched before washing hands.

Dr. Michail Karavolos, microbiologist and BioCote's Technical Manager says: 'In many cases germs are spread via touch, so we can see that objects touched after people have used the toilet, but before they have washed their hands can be just as contaminated.'

The less obvious objects and surfaces such as the floor, the wall and the underneath of the toilet were also contaminated. Dr. Michail explains 'this is probably because people only tend to clean the areas they can see, and the areas where they expect the bugs to grow.

Unfortunately, bacteria and mould can be found everywhere and, without thorough cleaning, will keep multiplying. We know most rooms are full of germs and although they may not necessarily be harmful, the higher the count, the greater the risk of illness.'

Whilst we may perceive items to be cleaner than others, our study highlights that the reality is that we can never really be sure.

That's when BioCote protected products come into effect. Utilising our logo, our partners' products provide additional peace of mind in areas that matter most – with a public toilet being a prime example.

BioCote

99.99% REDUCTION IN THE H1N1 INFLUENZA VIRUS ON BIOCOTE TREATED MATERIALS

Outbreaks of influenza caused by the H1N1 virus are a repeated threat. The contagious H1N1 virus spreads effectively between people and, due to widespread international travel, between countries.

July 2009 saw the beginning of the most recent global H1N1 influenza pandemic with around 30,000 confirmed cases reported in 74 countries, although unconfirmed cases make this outbreak undoubtedly more significant. The economic impact of influenza can be huge; the World Health Organisation estimated an H1N1 pandemic could cost the UK economy over £70 billion so a measure with the potential to limit the spread of viral infection is worthy of including in an infection control strategy.

The evidence described here suggests the application of BioCote® antiviral technology has the potential to complement strategies aimed at inhibiting the spread of viruses responsible for the influenza illness.

Viruses cause human disease by infecting cells of the body. Viral disease can be averted if the virus is rendered non-infectious before it enters the body's cells and establishes an infection. Antiviral vaccines typically operate by converting the virus from an infectious to noninfectious form.

This study quantified the conversion of influenza A H1N1 virus from an infectious to non-infectious form because of its exposure to BioCote® containing materials.

Aim

To understand how effective BioCote® approved silver ion antimicrobial technology is against influenza A H1N1 virus when incorporated into various manufacturing materials.

Method

Known amounts of infectious H1N1 virus were added to the surface of a variety of materials commonly used for manufacturing that contained BioCote® approved antimicrobial silver ions; specifically acrylonitrile butadiene styrene (ABS), polycarbonate (PC), thermoplastic polyurethane (TPU), polyvinyl chloride (PVC) and polybutylene terephthalate (PBT) polymers, laminated wood board and wet and powder paints.

Exposures were left overnight after which the virus was recovered from the test materials. Viruses still able to infect cells after exposure to BioCote® technology were counted using an immunological microplate plaque assay.

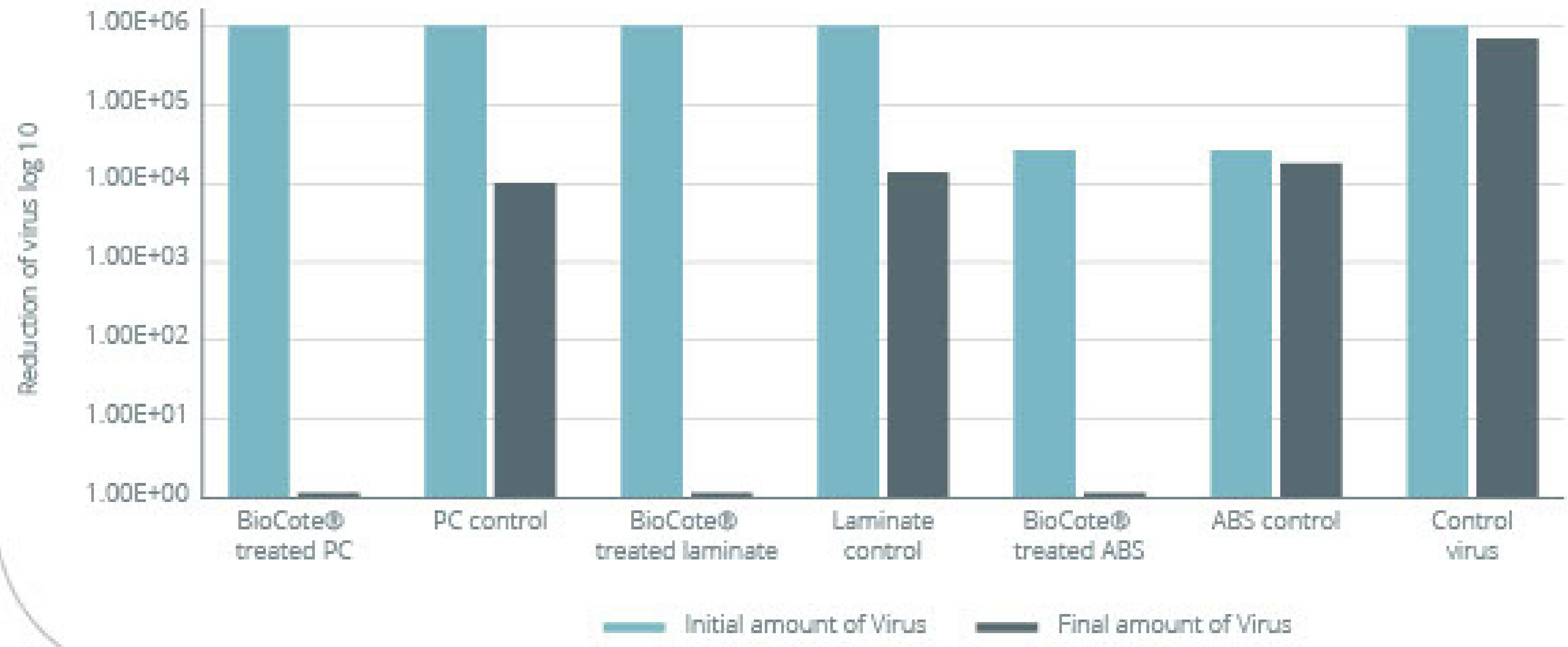
Controls were also included in this study to determine the amount of virus inactivation directly attributable to BioCote® silver technology.

RESULTS

All BioCote® containing materials demonstrated significant antiviral activity compared to untreated and/or virus controls.

Figure 1 shows the reduction of infectious H1N1 virus due to its exposure to BioCote treated materials, compared to untreated materials (controls). A control of the H1N1 virus not exposed to any material is also included.

FIGURE 1 Reduction (in numbers) of infectious H1N1 virus exposed to treated materials



RESULTS FOR POLYCARBONATE (PC) AND LAMINATE

>99.99% reduction in viable H1N1 virus particles on BioCote treated PC

>99.99% reduction in viable H1N1 virus particles on BioCote treated laminate

CONCLUSION

BioCote® approved silver ion technology is effective at significantly reducing numbers of infectious influenza A H1N1 virus. Antiviral activity was demonstrated by BioCote® containing ABS, PC, TPU, PVC and PBT polymers, laminated board and wet and powder paints.

CASE STUDY: HOSPITAL

96% REDUCTION IN BACTERIA IN A HOSPITAL ENVIRONMENT

The control of healthcare-associated infections (HCAIs) remains a challenge for healthcare providers. This involves employing a combination of infection prevention and control strategies, including hand hygiene, cleaning, training and the adoption of new technologies, to tackle the problem.

As a result, a wide range of infection control products and technologies are available on the market, including antimicrobial technology.

BioCote Ltd works with equipment manufacturers, engineering silver ion technology into a variety of healthcare related products, helping them to resist the growth of bacteria and mould on their surface. Silver is an ideal antimicrobial agent because it has a high efficacy against a wide range of medically-important microorganisms and is regarded as non-toxic.

For the NHS and other healthcare providers to employ new technologies and products they need to show a demonstrable ability to contribute positively to infection control. The use of any product that claims it has antimicrobial efficacy should be supported by a robust evidence-base.

Aim

A pilot study, conducted at the Heart of England NHS Foundation Trust, investigated to what extent BioCote® antimicrobial products can reduce microbial contamination in a healthcare environment.

In independent laboratory tests, BioCote® antimicrobial protected materials regularly demonstrate reductions in counts of E. coli and S.aureus greater than 99%, compared with untreated samples.

The aim of this study was to determine to what degree this high level of antimicrobial efficacy could be achieved in a real-life hospital environment.

Study

Two outpatient units provided the environments for this 18 month pilot study. Unit A was refurbished with BioCote® treated products including blinds, tiles, door handles, sack holders and light switches and also a number of untreated products. A similar, refurbished outpatient ward containing untreated items (Unit B), served as a control.

Both outpatient units were similar in terms of volume of people, layout and floor-surface area and were subjected to standard cleaning practice. Both were allowed to function for 12 months before swabbing commenced.

Swabs were collected over a five month period from BioCote® treated and untreated products in both outpatient units. Swabs were processed for total counts of viable bacteria and results expressed as average counts of colony-forming units (CFUs).

BioCote

RESULTS

Table 1 shows that CFU counts from BioCote® treated products in unit A were between 62% and 98% lower than from comparable, untreated products in Unit B.

The products used in the trial were manufactured from a variety of materials e.g plastics and fabrics. CFU counts from these different materials were also compared and are shown at the bottom of Table 1.

CFU counts from BioCote® treated materials were between 70% (fabrics) to 99% (laminates) lower than untreated equivalents.

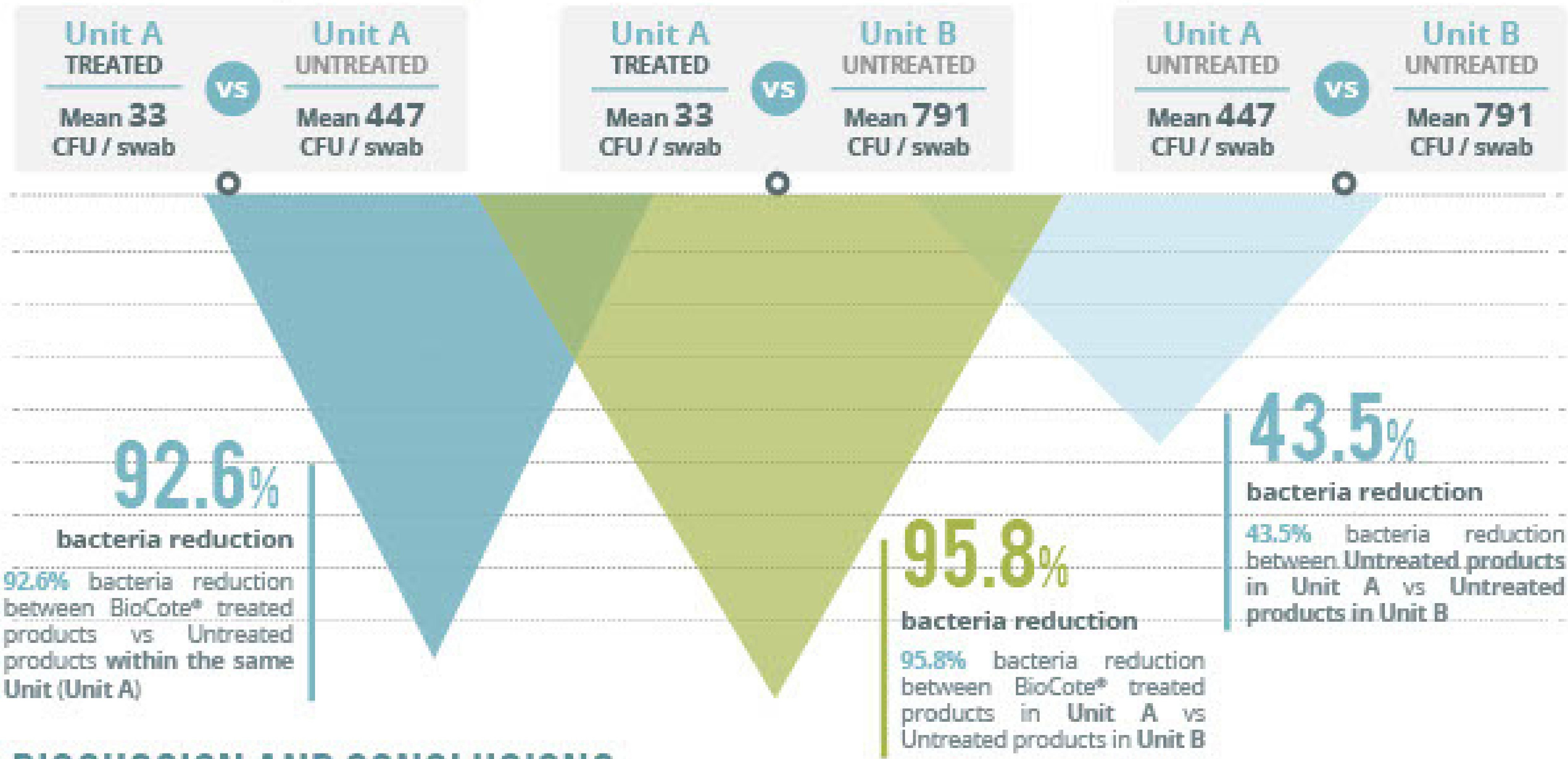
CFU counts from BioCote® treated products in Unit A were compared with CFU counts from untreated products in both Unit A and Unit B.

CFU counts on untreated products in Unit A were also compared to untreated products in Unit B.

TABLE 1: **Unit A - BioCote® treated vs Unit B - Untreated**
% reduction of CFU counts, on products & materials

Product	% Reduction
Door	98%
Door handle	89%
Electrical switch	95%
Curtains / Blinds	73%
Chair	93%
Treatment couch	62%
Sign	75%
Waste Bin	84%
Tiles	90%
Material	**% Reduction**
Powder coating	94%
Plastic	98%
Wood lacquer	98%
Fabric	70%
Laminate	99%

FIGURE 1: **Inter-site comparison of average (mean) CFU counts from BioCote® treated and untreated products in Units A and B.**



DISCUSSION AND CONCLUSIONS

Results suggest that BioCote® antimicrobial products will demonstrate the same high level of antimicrobial efficacy in a real-life environment as seen in laboratory tests, e.g. an average bacterial reduction of 95.8%.

In addition to the effect of standard cleaning, BioCote® antimicrobial products showed sustained reductions in bacterial counts, compared to untreated products. Because BioCote® technology does not wear out or wipe off surfaces, it can provide a continuous decontamination effect. Treated products can complement cleaning practices, helping to continually reduce levels of bacteria on surfaces and in the wider healthcare environment.

Bacterial contamination on untreated products in Unit A was on average 43.5% lower compared with untreated products in Unit B. This suggests that a reduction in bacteria on BioCote® antimicrobial surfaces results in lower numbers of bacteria on other surfaces because there are fewer bacteria being transferred. Using a number of antimicrobial objects in a healthcare environment may therefore help the decontamination of the wider environment.

This study, first published in the Journal of Infection Prevention1, highlights the ability of BioCote® treated antimicrobial products to reduce levels of bacteria contaminating healthcare settings.

PROVEN UNDER THE MICROSCOPE IN THE LABORATORY

An investigation on how to visualize and quantify the antimicrobial effect of BioCote's additives on polymers via molecular dyes and microscopy.

Good performance to international standard test criteria can be considered the first step in taking an antimicrobial product to market.

Percentage reductions of bacteria numbers from this testing may require additional explanation and context when an understanding for the potential of antibacterial properties are made available to interested parties who perhaps do not have a scientific or technical background.

With this in mind, we investigated how we might demonstrate antibacterial performance via other means. In collaboration with Birmingham University Technology Hub Imaging Core, we determined that epi-fluorescent microscopy with a live/dead staining system could visualize microorganisms on BioCote® treated and untreated polymer.

The visual results of this imaging are contained within this report, as well as antibacterial efficacy data.

Method

Antibacterial analysis

BioCote® treated and control polymer was assessed for antibacterial properties via the international standard ISO22196:2011. Testing of the material was performed against three organisms, Escherichia coli, Staphylococcus aureus (MRSA) and Pseudomonas aeruginosa.

Samples were inoculated with known quantities of test organism and incubated at 37°C for 24 hours. After incubation remaining cells were washed from the surface of the assessed material, diluted as appropriate and counted. Results were then expressed as a percentage.

Fluorescence microscopy imaging

Small plaques of BioCote® treated and control material was prepared and test bacteria applied and incubated for 3 hours at 37°C. Bacteria were then colored with molecular dyes which stained the bacteria (**red** if dead and **green** if alive). Images were then obtained via microscopy. Test bacteria were Pseudomonas aeruginosa, E. coli and Salmonella spp.

RESULTS

Antibacterial ISO22196:2011

A summary of the results of antibacterial analysis are shown in Table 1. Excellent antibacterial effectiveness was demonstrated for all three organisms. The table displays percentage reductions against control (reduction when compared with organisms recovered from non-treated control material) and initial (reduction of the total number of organisms loaded onto the material).

TABLE 1:

Species	% Reduction (control)	% Reduction (initial)
P. aeruginosa	99.67%	97.46%
E. coli	≥ 99.99%	≥ 99.91%
S. aureus (MRSA)	≥ 99.89%	≥ 99.93%

Fluorescence microscopy imaging

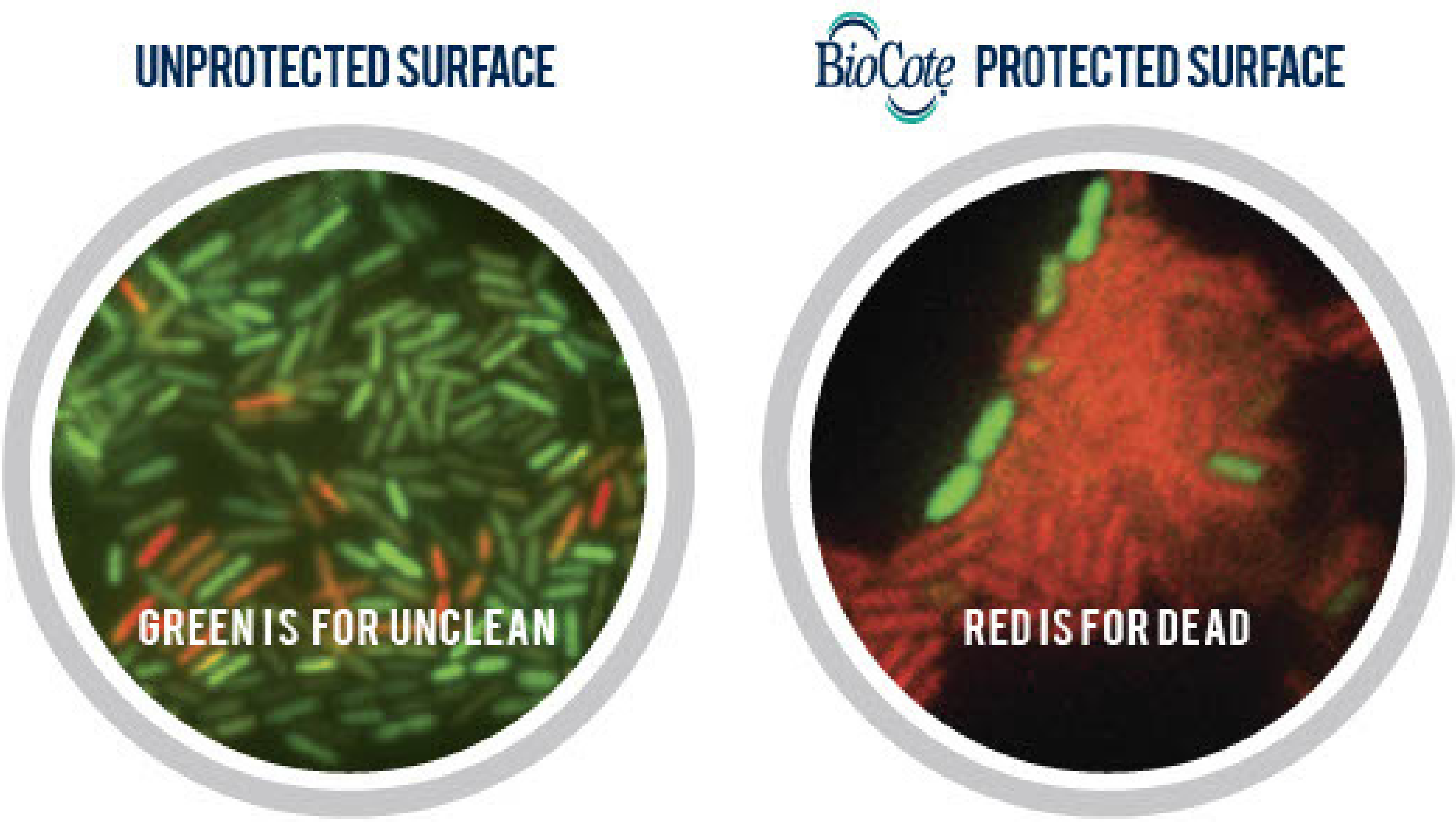
The results of the imaging of Pseudomonas aeruginosa are displayed below, in Figure 1.

Green indicates living cells, stained with the Syto9 dye, whilst red shows dead, stained with propidium Iodide dye.

Of the three organisms tested, Pseudomonas was able to adhere to the surface sufficiently for imaging in the 3 hour time frame.

Via computer based imaging tools we approximated 37% of cells to be dead in the field for the control material. In contrast, the treated sample displayed approximately 94% dead cells within the visual field.

FIGURE 1: The results of the imaging of Pseudomonas aeruginosa on control (left) and silver ion containing (right) polyethylene plaques. Green indicates living cells, whilst red shows dead cells.



Imaging performed by Dr. Robert K. Shaw, Imaging Specialist, Technology Hub Imaging Core, College of Medical and Dental Sciences, University of Birmingham.

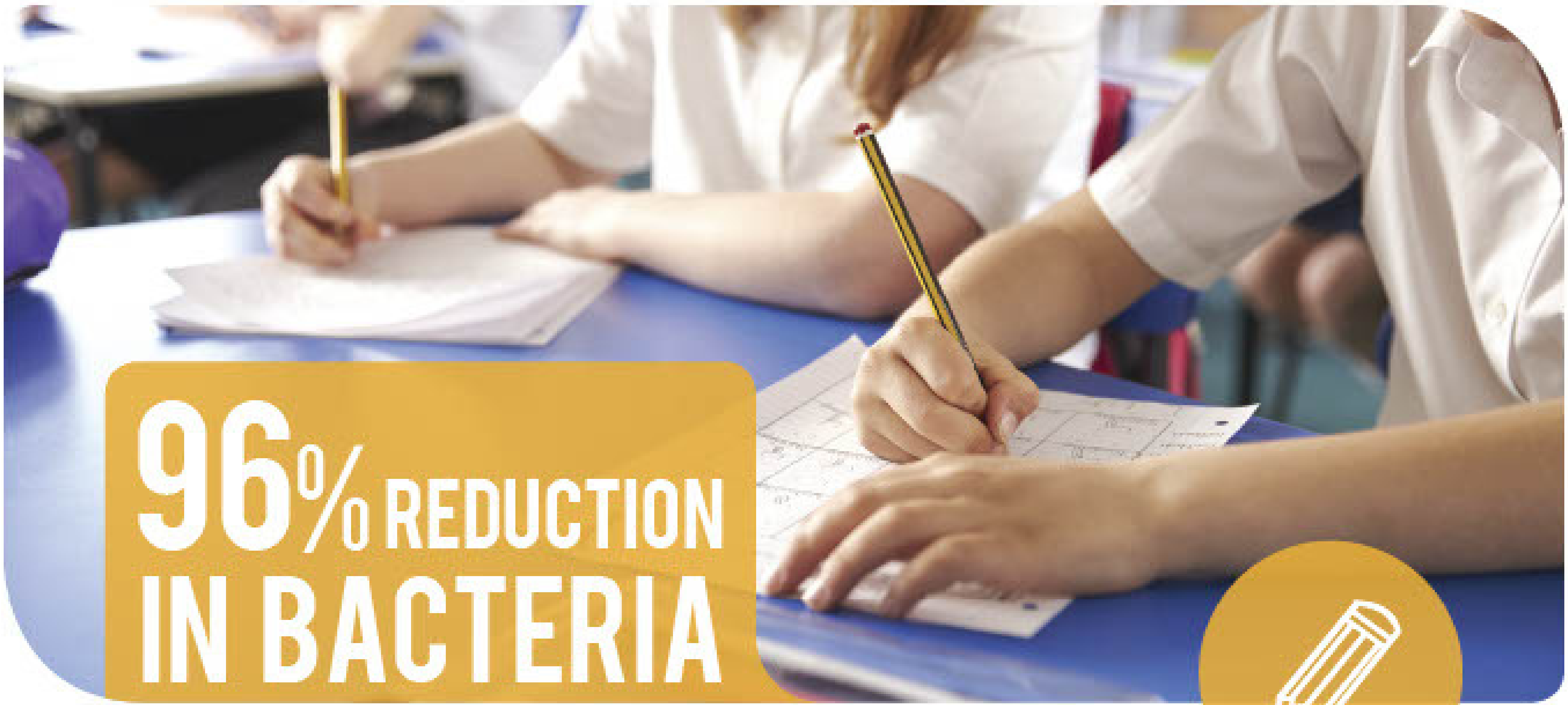
DISCUSSION

Pseudomonas aeruginosa was able to adhere sufficiently to the polymer surface in the allotted time, allowing imaging. After three hours of growth the organism had initiated biofilm formation, which aided or possibly allowed adherence to the necessary levels for visualization.

To achieve good a representative image a balance was sought between contact or incubation time of test organism and the polymer, and the desire to demonstrate a timely bactericidal action. The three hour incubation time of the test organism and material has presumably allowed P. aeruginosa time to adhere prior to accumulating sufficient cellular damage via the biocidal action of silver, which resulted in the death of the cell and accumulation of propidium Iodide stain.

We were able to successfully demonstrate visually the antibacterial properties of BioCote® treated polymer.

Significant differences between BioCote® treated and control material were observed, demonstrating excellent efficacy comparable levels of to ISO22196:2011 results.



96% REDUCTION IN BACTERIA IN A SCHOOL ENVIRONMENT

School classrooms present the classic factors important for the efficient spread of microbes; close contact of people for prolonged periods, numerous commonly touched, communal surfaces and isolated cleaning. Hygiene in these environments is, therefore, important in order to reduce the risk and consequences of microbial cross contamination.

Inevitably, good hygiene guidance for education providers from government1 includes regular, thorough environmental cleaning. However, developments in antimicrobial technology now offer the ability to create indoor environments composed of materials that act continuously by reducing the presence of microbes contaminating them.

The rationale for hygienic classrooms is obvious. Does the application of antimicrobial technology to a classroom have a beneficial impact?

Aim

To measure and compare the numbers of bacteria in two classrooms in the same primary school after antimicrobial technology has been extensively applied to one whilst the second is unchanged.

Method

In the autumn of 2014, a medium-sized UK primary school was selected as suitable for the purposes of this environmental study. A classroom was refurbished with computer desks, chairs, door handles, light switches, liquid soap dispensers, cable trunking, sockets, tables, storage trays, bookcases, storage units, castors, carpet, radiator covers, window handles, wall and ceiling paint, PVC wall cladding and a drinking water dispenser all treated with BioCote® antimicrobial technology. Products were donated for the purpose of this study by BioCote Ltd Partners.

A second classroom was included in this study to serve as a control environment. The demographics of both classrooms was suitably comparable. Both classrooms were used and cleaned as normal. Typical daily cleaning of school classroom involves the wiping of desks, sinks and draining board, sweeping the hard floor and vacuuming carpet. In addition, a weekly clean involved dusting of computers, shelves and worktops and mopping of non-absorbent floors.

A weekly collection of swab samples began in November and extended throughout the academic year. Antimicrobial products were swabbed from the antimicrobial classroom whilst corresponding, untreated products and surfaces in the control classroom were swabbed at the same time.

Swabs were collected before and after the school day and processed appropriately in the microbiology laboratory to isolate, count and where possible, identify bacteria (data not shown here) recovered from the study classrooms.

RESULTS

Total environment: A comparison of the average number of bacteria recovered from all BioCote treated products with all corresponding products in the control classroom revealed almost 96% less bacterial contamination in the antimicrobial classroom.

FIGURE 1: The difference in total bacterial counts between the classrooms: 95.74%.

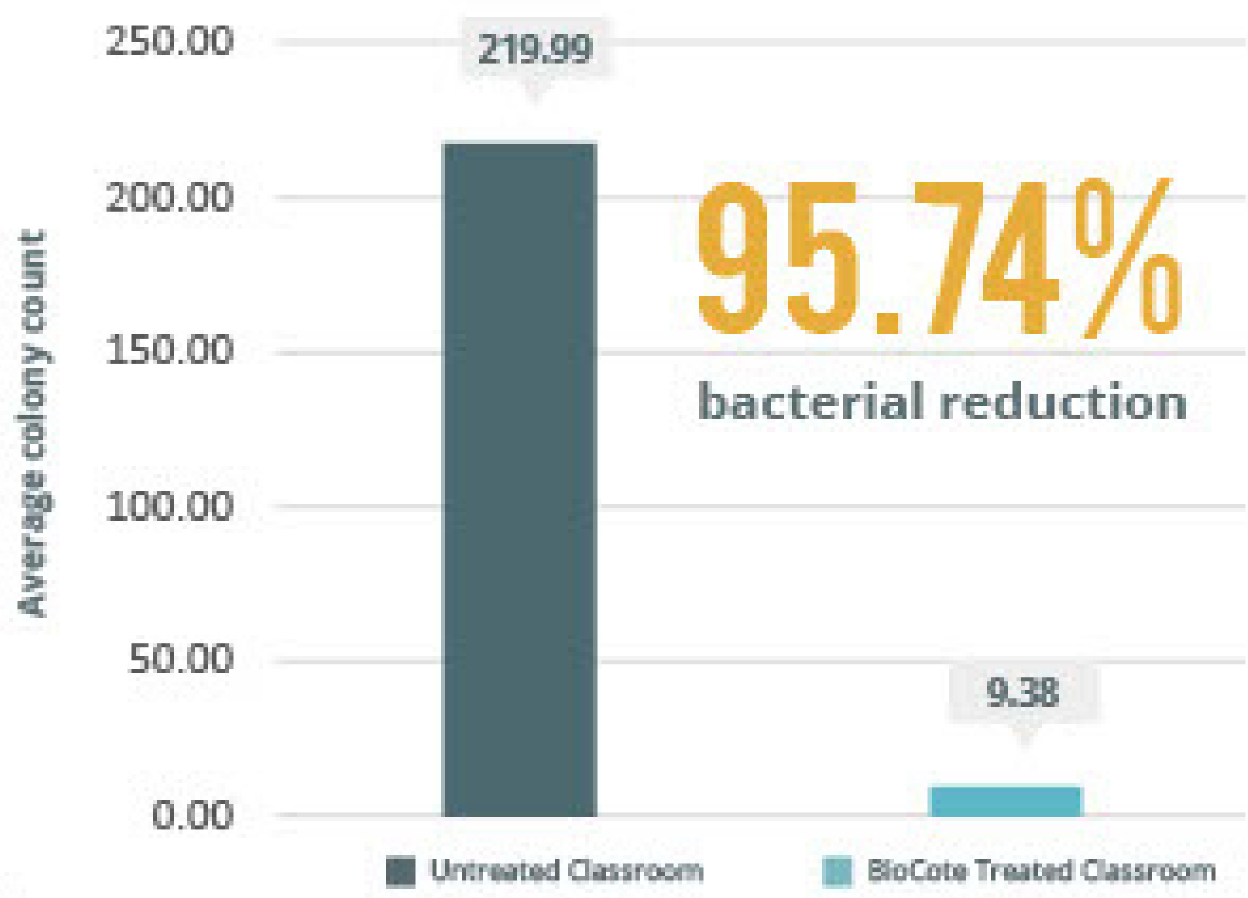
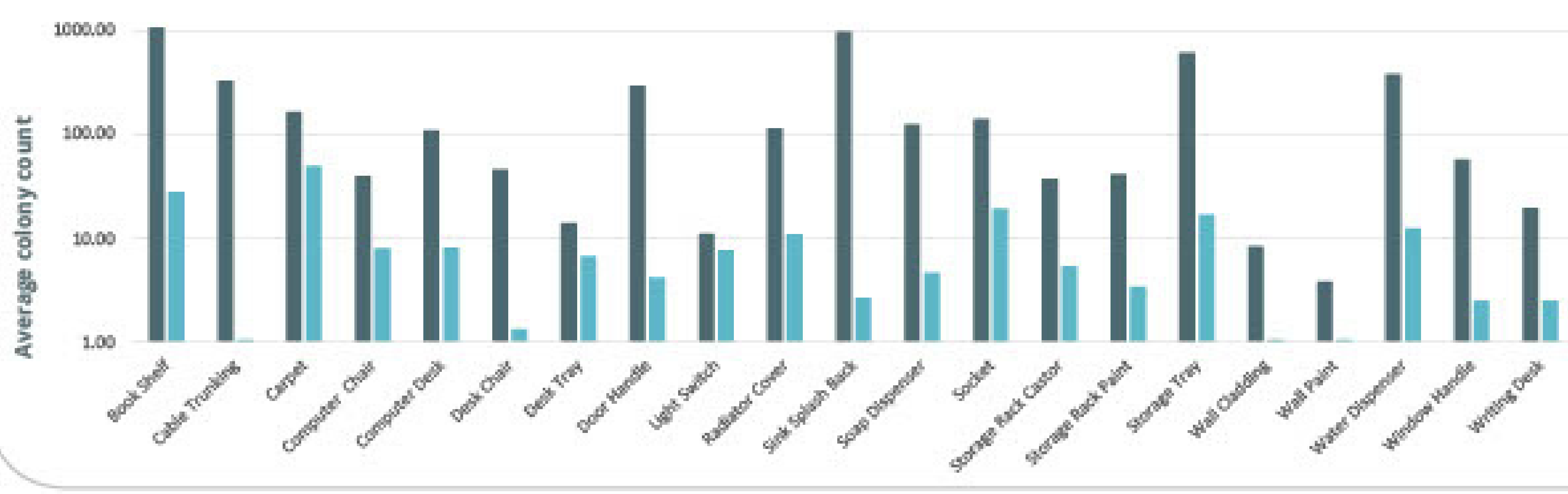


TABLE 1: % reduction in average colony counts per product in the BioCote® treated vs Untreated classroom

Product	% Reduction
Book shelf	97.43%
Cable trunking	99.90%
Carpet	70.09%
Computer chair	79.90%
Computer desk	92.65%
Desk chair	97.12%
Desk tray	52.38%
Door handle	98.58%
Light switch	30.30%
Radiator cover	90.54%
Sink splash back	99.73%
Soap dispenser	96.26%
Socket	86.24%
Storage rack castor	85.84%
Storage rack	91.90%
Storage tray	97.22%
Wall cladding	99.99%
Wall paint	91.30%
Water dispenser	96.79%
Window handle	95.61%
Writing desk	87.73%

FIGURE 2: Differences in average colony counts per product in the Untreated classroom vs BioCote® treated classroom



DISCUSSION

The two classrooms studied were chosen due to their similarities in use, location and demographics. From this basis, the difference between the two classrooms was the presence of antimicrobial technology. It is reasonable to view the reduced counts of bacteria on the antimicrobial products, compared to the control classroom's counterparts, is a direct result of those products' continued antimicrobial performance.

Before release into the market, products treated with BioCote® technology are validated for acceptably high antimicrobial efficacy. In theory, then, reduced counts of bacteria contaminating BioCote treated products deployed in working environments, compared to equivalent but untreated products should be expected. Previous environmental studies measuring bacterial counts on antimicrobial surfaces also reported them to be less contaminated than untreated counterparts2,3.

Antimicrobial technology should not be viewed as a replacement to cleaning. However, the repeated observation of considerably fewer bacteria present on antimicrobial products, regardless of product type and when the observation was made, compared to those counts made from the control classroom, presents a compelling case for the application of antimicrobial technology to hygiene-critical environments.