An Evaluation of the Antimicrobial Properties of Sychem CONTROL - a Novel Sanitising Product for use in Healthcare Facilities

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BACKGROUND

The Problem
Community health care buildings and group residence homes are second only to hospital wards and departments in offering shelter and breeding spaces for infective agents. This has occupied the minds of clinicians and planners from before Nightingale and Lister, and never more so than in the era of MRSA, clostridium difficile and "avian flu". Staff personal hygiene between episodes of patient/client contact is being exhorted with the vigour of the pre-antibiotic days. Attention is additionally focused on wards, rooms, furniture and instruments.

TEST LOCATIONS

Appraisals were performed by testing for microbial presence at several locations in each of a GP surgery *(Leesbrook Surgery)* and an elderly residential home *(Westcott House)*. Sites were chosen to represent variations in frequency of human contact, frequency of intensive cleaning and relevance to the health care process. Thus the sphygmomanometer represents a frequently used and directly health-related site; toy bricks represent a less frequently cleaned and health-unrelated site.

THE AGENT

Sychem CONTROL is a polyvalent microbiocidal agent bonded to a matrix and presented in an aqueous solution which can be used as a cleansing agent or a surface spray. It is non-damaging to surfaces, whether metal, plastic, wood, painted or fabric. It is non-toxic, non corrosive, has a similar hazardous specification to distilled water and has passed British Standard 6920 for use in the treatment of drinking water. It is currently used in the passenger aircraft industry to reduce possibilities of cross infections primarily associated with toilet facilities and the galleys – forced by weight considerations and aircraft design to be sited in close proximity. Sychem CONTROL has been tested against a wide range of pathogens, including all common causes of sepsis, wound infection, gastrointestinal and respiratory infections, especially those which have attracted media attention – MRSA, c. difficile, legionella, and E.coli 0157.*

TEST METHOD

Adenosine tri-phosphate (ATP) bioluminescence is an accepted and widely used method of monitoring levels of contamination *(Bautista et al., 1994)*. Measuring ATP has an advantage in that its presence indicates the level of microbial / organic contamination on a surface allowing a rapid verification of the efficiency of the sanitisation. This provides immediate notification of the presence of potentially harmful pathogens. ATP is used widely in industry, particularly in food production and in clinical research, providing comparable results to traditional CFU (Colony Forming Unit) plate counts which can take up to 14 days to complete *(Gupta et al., 2001; Froundjian et al.)*. ATP levels are recorded in levels of Relative Light Units (RLU). The following bioluminescence ranges were agreed to serve as an approximate guide for interpretation of results:-

RLU COUNT INTERPRETATION

0-50	Background test reading
50-150	Acceptable autoclaved levels for surgical instruments
150-300	Acceptable in intensive or deep cleaning procedures
300-500	Acceptable level for food surface production locations and equipment
500-1000	Clean domestic surfaces
1,000-10,000	Infrequently cleaned and unsafe public surfaces
10,000+	Highly contaminated and unsafe surfaces

ATP levels are subjective and pass / fail levels should be set appropriately to the environment in which the tests are conducted. Background levels should be taken and pass / fail levels agreed in relation to current "accepted" sanitising procedures. Pass / fail levels should be reviewed when sanitising materials / procedures are changed to assess the impact on cleanliness levels.

DATA ACQUISITION

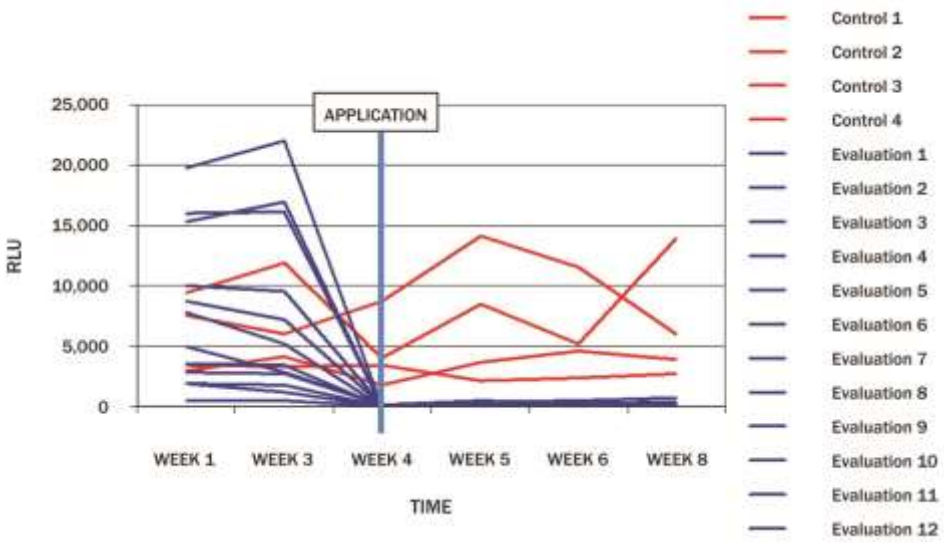
The test sites were chosen to represent variety in frequency of use, frequency of intense cleaning, level of human contact and relevance to care provision. All locations were swabbed with a Purebase® swab which was immediately inserted into the Purebase® bioluminescence measurement device. Areas were swabbed in a close zig-zag pattern in one direction, then at right angles and then again in the original direction over an area of 10cm x 10cm or the size of the object, whichever was the smaller. The sites were swabbed at the end of the working day, same day of the week, before the daily cleaning process, initially twice at a fortnightly interval to establish baseline levels. No alterations were made in the normal cleaning processes in the buildings. In the next week the test sites were treated with Sychem CONTROL and samples taken after 20 minutes. In subsequent weeks the normal cleaning regime was resumed and routine samples were taken from the same locations, at the same time of day and day of the week.

RESULTS

Leesbrook Surgery Data

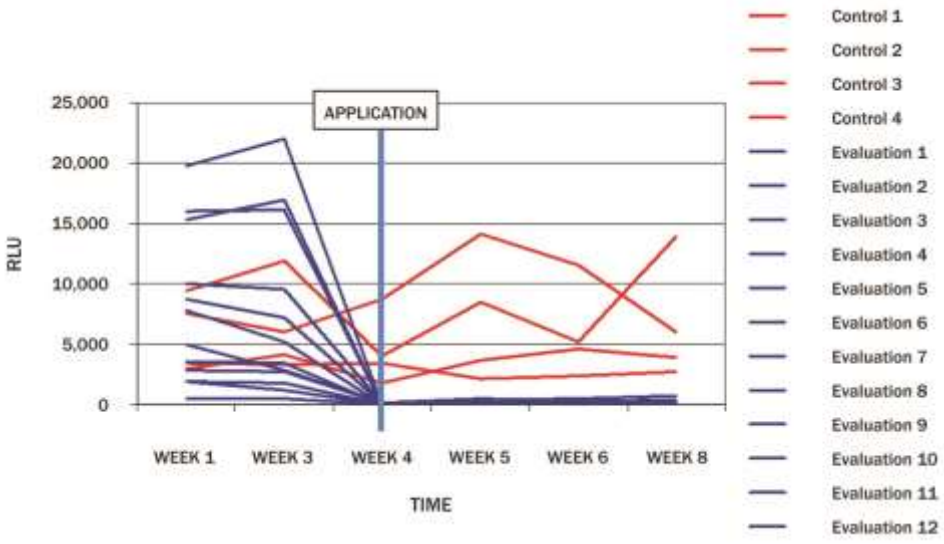
	WEEK 1	WEEK 3	WEEK 4	WEEK 5	WEEK 6	WEEK 8
Control 1	3,422	3,352	3,411	2,070	2,416	2,696
Control 2	2,984	4,078	1,749	3,660	4,620	3,835
Control 3	7,524	5,969	8,743	14,207	11,607	5,972
Control 4	9,453	11,895	3,990	8,493	5,215	13,911
Evaluation 1	19,800	22,104	22	15	169	54
Evaluation 2	498	426	44	13	10	15
Evaluation 3	2,848	2,721	73	261	103	383
Evaluation 4	1,874	1,222	13	96	35	31
Evaluation 5	4,919	2,836	82	400	205	109
Evaluation 6	15,321	16,995	18	24	161	42
Evaluation 7	10,028	9,587	169	439	267	296
Evaluation 8	7,769	5,213	36	96	99	185
Evaluation 9	8,712	7,163	147	111	70	182
Evaluation 10	15,997	16,180	7	17	16	8
Evaluation 11	3,562	3,411	38	207	240	46
Evaluation 12	1,845	1,749	26	366	486	716

Time of application of TECare™



Westcott RCH Data

	TEST 1	TEST 2	TEST 3	TEST 4	TEST 5	TEST 6	TEST 7	TEST 8	TEST 9	TEST 10	TEST 11	TEST 12	TEST 13	TEST 14
Dining Room Control	2,529	2,163	758	2,388	2,150	1,646	1,373	1,380	1,503	1,559	1,609	1,621	1,590	1,624
Dining Room Evaluation	33,972	17,121	21,259	5,603	441	7,383	3,612	2,055	307	404	791	1,260	1,440	1,707
Lounge Control	18,925	7,382	3,215	3,627	5,071	15,151	8,888	9,349	5,299	5,936	10,163	12,305	20,608	8,209
Lounge Evaluation	5,264	4,978	2,666	2,950	513	2,332	2,582	2,452	375	463	395	719	1,340	619
					Time of application of TECare™				Time of application of TECare™					



DISCUSSION

The Leesbrook Surgery untreated control sites demonstrated a persistence of microbial contamination varying from halving to doubling over the survey period. This represents typical variation in the microbial contamination of "clean" surfaces frequently touched by members of the public. Natural variations will occur in the levels of micro-organisms carried by members of the public and in the microbiocidal power of various cleaning agents and methods. The evaluation sites showed a universal drop in RLU count of 97-99% in the first 20 minutes following administration of Sychem CONTROL. This was maintained over the next 5 weeks at a level of 90% reduction in all but 4 sites; those sites retaining reductions of 89%, 85%, 85% and 59%. The RLU values achieved in all evaluation locations were deemed to have achieved acceptable levels for a healthcare facility, in relation to the baseline data recorded, and according to the criteria previously agreed, were clean enough to serve as food production surfaces after 5 weeks, without further treatment. The one location which retained only 59% reduction was the GP's sphygmo-manometer *(Omron 711)* surface, still remaining acceptably clean. By contrast the control locations showed spontaneous increases in RLUs of up to 60% and spontaneous reductions of up to 29%, in any one week. The Westcott House data shows results from four areas of the establishment – kitchen, dining room, lounge and staff toilet. In each area a control site was tested on each occasion without any application of Sychem CONTROL. The several test sites were treated with the product. In the lounge and dining room a second treatment process took place 3 weeks after the first. Typical RLU count reductions were from the level of several thousand to a few hundred (e.g. 14,917 to 492, the greatest drop being 18,963 to 242 and the least being 10,078 to 2,083 [highest outcome figure] or 639 to 502 [least proportional drop]). RLU counts in the lounge and dining areas re-achieved about 40% of starting levels after 3 weeks, and a second application of Sychem CONTROL produced a further, deeper and better sustained reduction. The control values remained steady throughout the test period.

CONCLUSION

The data show that an application of Sychem CONTROL reduces the RLU count of a swab taken of an area of contact for members of the public, for clients of health and social care services and for the providers of those care services. RLU counts can be shown to translate directly into microbial contamination levels *(Pellowe et al., 2004; Griffi th et al., 2000; Loimaranta et al., 1998; Somiya et al., 2000);* the organisms studied here will be mostly harmless community-encountered bacteria but could include the vectors of wound sepsis, gas gangrene or gastrointestinal or respiratory infection. According to Pass / Fail levels agreed prior to the evaluation (see table in Fig. 1), the levels of reduction achieved were, equivalent to those thought to be obtained by autoclaving. The level of sanitisation persisted, despite potential recontamination through normal day to day use, for three to five weeks after application demonstrating the residual antimicrobial properties of Sychem CONTROL on treated surfaces. The levels appear to remain lower for longer periods after subsequent applications. Sychem CONTROL therefore represents an invaluable but inexpensive surface treatment which can keep health and social care locations as free from infective agents as can be achieved with destructive, toxic or harmful agents but for longer than those agents could be expected to be effective. Sychem CONTROL is non-toxic and harmless to surfaces and skin.
It is available as a hand cleanser, surface cleanser or as a room treatment.

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