

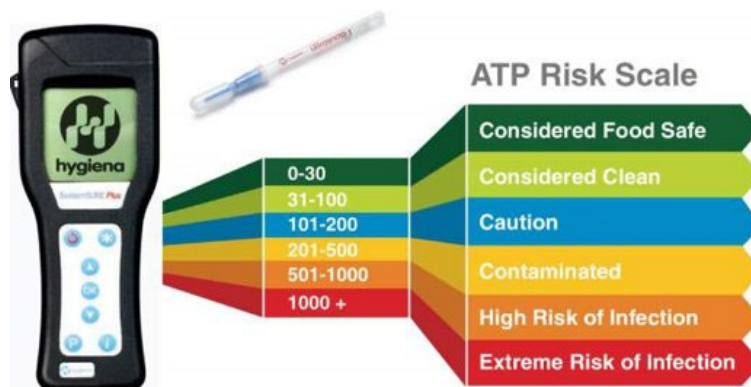
ZOONO ANTIMICROBIAL PROTECTION: BREWERY CASE STUDY

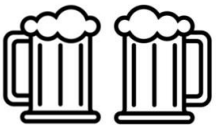
Introduction

Zoono is an innovative technology that aims to improve health and well-being by providing pioneering, durable germ protection. Zoono Group Limited is a Global Biotechnology company that develops and manufactures a suite of long-lasting, scientifically validated antimicrobial solutions. As a company, Zoono not only believes in its technology being able to provide enhanced antimicrobial protection within industry, healthcare, transport, and household settings, but regularly carries out in-field trials to prove this. It is important to note the limitations of traditional disinfection products using active ingredients such as bleach or alcohol. These products are only effective whilst wet and recontamination of surfaces and skin can occur once the product has dried. Misconception about how long alcohol-based hand sanitisers remain effective for has come to light in various studies published online, with some members of the public not realising these products are only effective for around two minutes.

Testing was carried out at the Head Quarters of a Brewery Site, including the pub, toilets, gift shop, offices, and dray lorries to assess the performance of Zoono Z-71 Surface Sanitiser when utilized in conjunction with the normal cleaning routine. It is widely accepted that germs spread quickly in areas where there are high volumes of people, through close contact and via environmental surface contamination. The high levels of footfall in busy buildings makes the opportunity for germs to spread incredibly easily. The trials are designed to assess the benefit of applying Zoono by taking ATP measurements pre-application and at several time points post-application, assessing product efficacy and its ability to reduce levels of surface contamination over extended periods of time.

ATP is a measure of a molecule called Adenosine Triphosphate which is present in all living organisms. In this instance, it is measured in relative light units (RLU) using a bioluminescence reader. Whilst ATP is a measure of all living matter, it is widely accepted within the food and healthcare industries as a useful, quick measure of environmental contamination. Below is a guide to what the ATP results mean:





The Zoono Technology

Zoono is a non-leaching, colourless and alcohol-free surface sanitiser that bonds to a surface, forming an antimicrobial coating that interacts with microbes. Zoono Microbe Shield is scientifically proven to be a longer-lasting water-based protectant that has a similar toxicity level to Vitamin C. Zoono provides an invisible protective barrier that covalently bonds to a range of surfaces to provide long-lasting protection against numerous pathogens including bacteria, fungi, and viruses. A positively charged layer of microscopic pins attract and lyse negatively charged pathogens. This invisible layer of pins causes the cell wall to rupture resulting in the pathogen breaking up with lethal effect.

As is well documented, bacteria and viruses can last for long periods of time on hands and surfaces (Hirose et al., 2020; Rawlinson, Ciric and Cloutman-Green, 2020). It is also evident that traditional disinfection has limited disruptive effect, as they are only active when in their wet phase, allowing recontamination to occur once the surface has dried. Surfaces that look and smell clean can quickly become a source of numerous pathogens, enabling the spread and transmission of disease. A recent study found COVID-19 present on a hospital bed was able to spread to 18 other surfaces within 10 hours (Rawlinson, Ciric and Cloutman-Green, 2020). This is where Zoono's innovative technology comes into play. Zoono bridges the gap between routine cleaning processes, modifying the surface to be disruptive to bacteria and viruses between routine cleanings. Zoono works as part of the greater solution for Infection Prevention and Control (IPC), posing as a new and important tool for the enhancement of IPC in the future.

Benefits of Zoono Microbe Shield include:

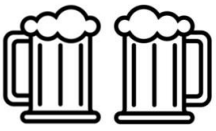
- Longer-lasting, effective for up to 30 days
- Ready to Use formulation
- Water based (does not contain alcohol)
- Does not promote microbial mutation (superbugs)
- Shelf-stable for 3 years
- Non-damaging to surfaces
- Not flammable
- Non-staining
- Odourless

Zoono has quantitative data supporting its efficacy from many internationally recognised laboratories. Zoono also enjoys registrations and approvals in numerous major countries/regions, including UK, Europe, America, and Australasia.

Case Studies: Surface Testing

Test Set Up

The testing was conducted at the Head Quarters of Brewery company, comprising of offices, communal space and a pub-restaurant in the UK from 4th May – 1st June 2021. For the purpose of the study, the offices, pub, gift shop, toilets and dray lorry cabs were assessed, and different sections of these areas were used as a Zoono-treated area and a control area. It was designed that within each area, the Zoono treated locations and the control locations were picked as they had a similar level of activity and use. In addition to having both Zoono-treated areas and control areas for the above-mentioned locations, the communal kitchen area and a communal office space containing a commercial printer/scanner/copier and franking machine were tested and treated with Zoono.

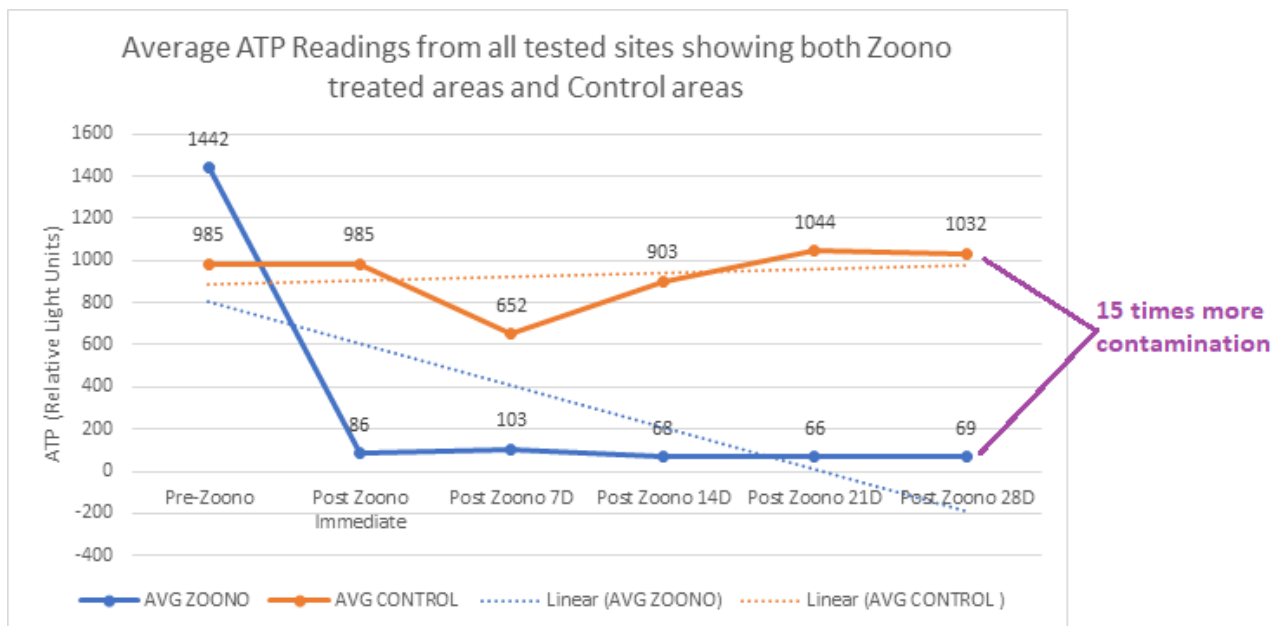


Throughout the duration of the study, both the Zoono treated areas and control areas were cleaned as per the normal cleaning regime, with no changes to the products, frequency, or intensity of cleaning. Initial readings (day 0) were taken prior to the application of Zoono (in both Control and Zoono treated rooms), and this was used as a baseline reading that was taken to be representative of the normal levels of surface contamination when cleaning with the normal housekeeping protocols. Zoono was then applied via a trigger spray and microfibre cloth application in the designated Zoono-treated locations only. A subsequent reading was taken in the Zoono-treated areas, once the application had fully dried, to assess surface contamination levels immediately post-application of Zoono. Follow up readings were taken in all areas on days 7, 14, 21 and 28. This was specifically designed so the addition of Zoono to the cleaning routine was the variable – the only factor being changed/assessed. This means the difference between the baseline results and the post-Zoono application results can be attributed solely to the addition of Zoono Z-71 and the enhanced, long lasting protection it provides against a range of pathogens.

Each test location was thoroughly recorded on the Zoono test results sheet to ensure the exact same location was swabbed at the follow up test dates. This allows direct comparisons to be made between each individual result across the 28-day test period.

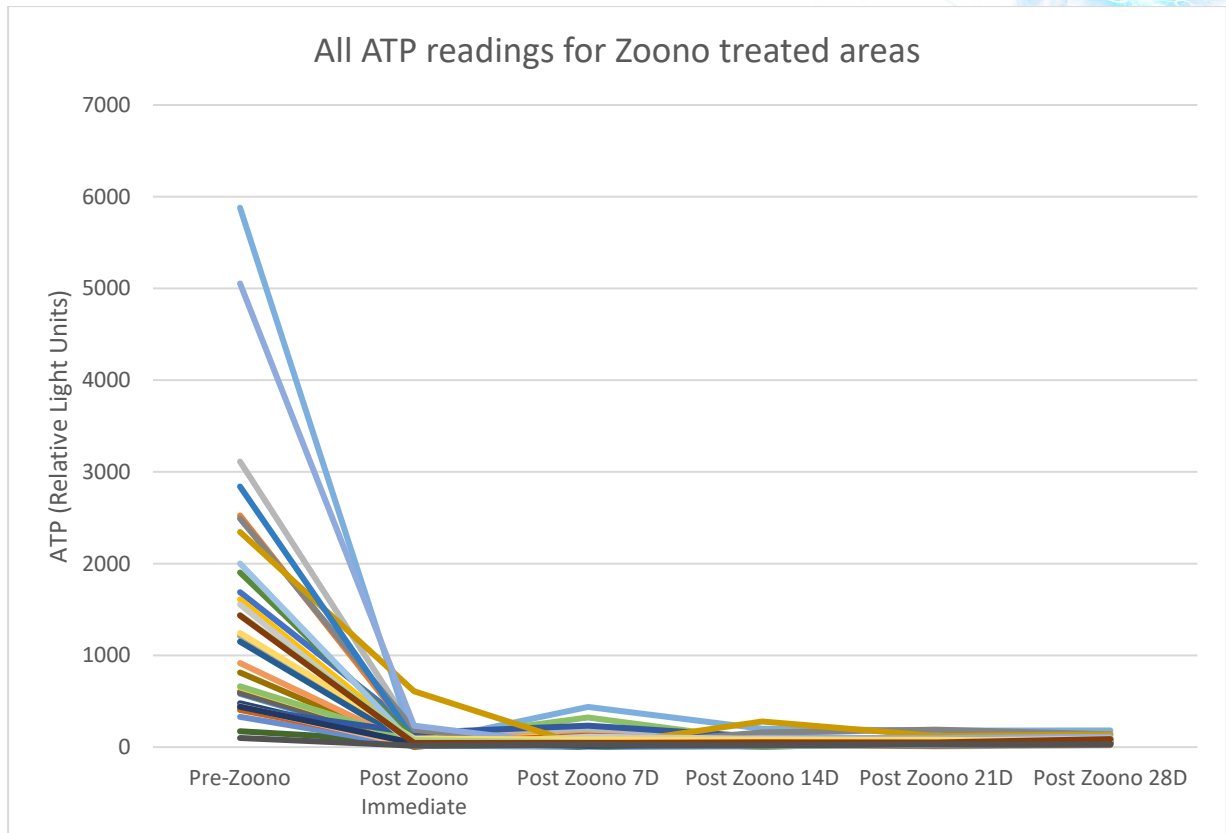
The Data

Graph A – Overall ATP reading averages for both all Zoono treated sites and all Control sites.

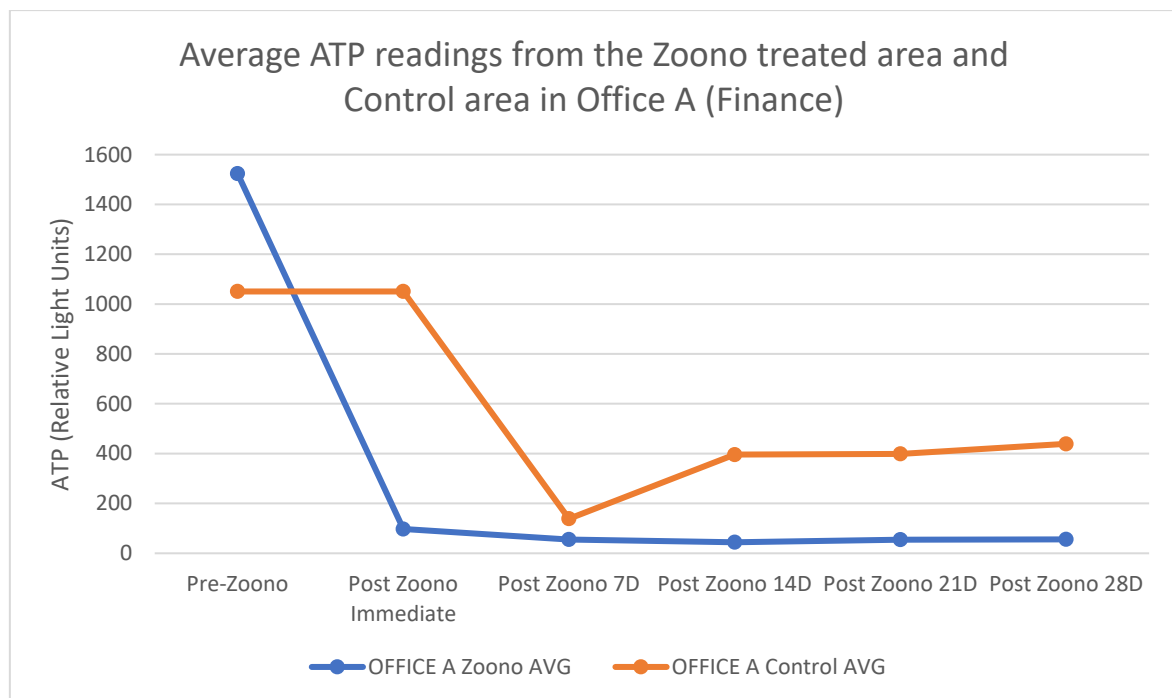




Graph B – Zoono All sites ATP readings.

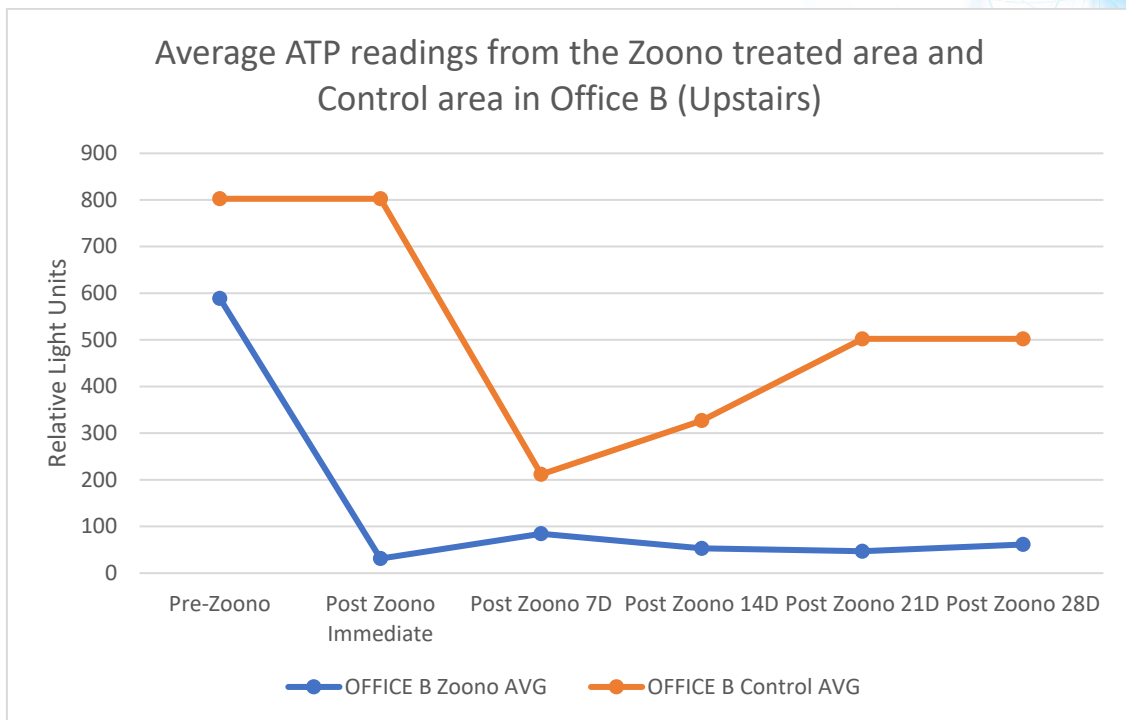


Graph C – Office A (Finance) average readings from the Zoono treated area and untreated control area.

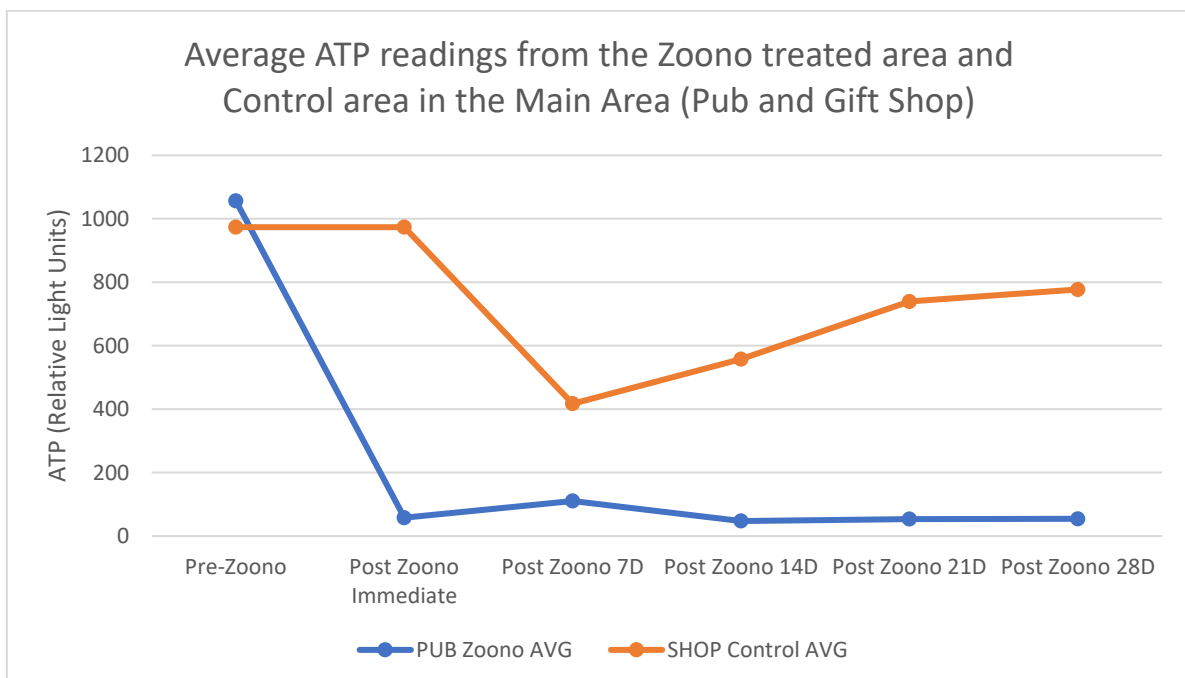




Graph D – Office B (Upstairs) average readings from the Zoono treated area and untreated control area.

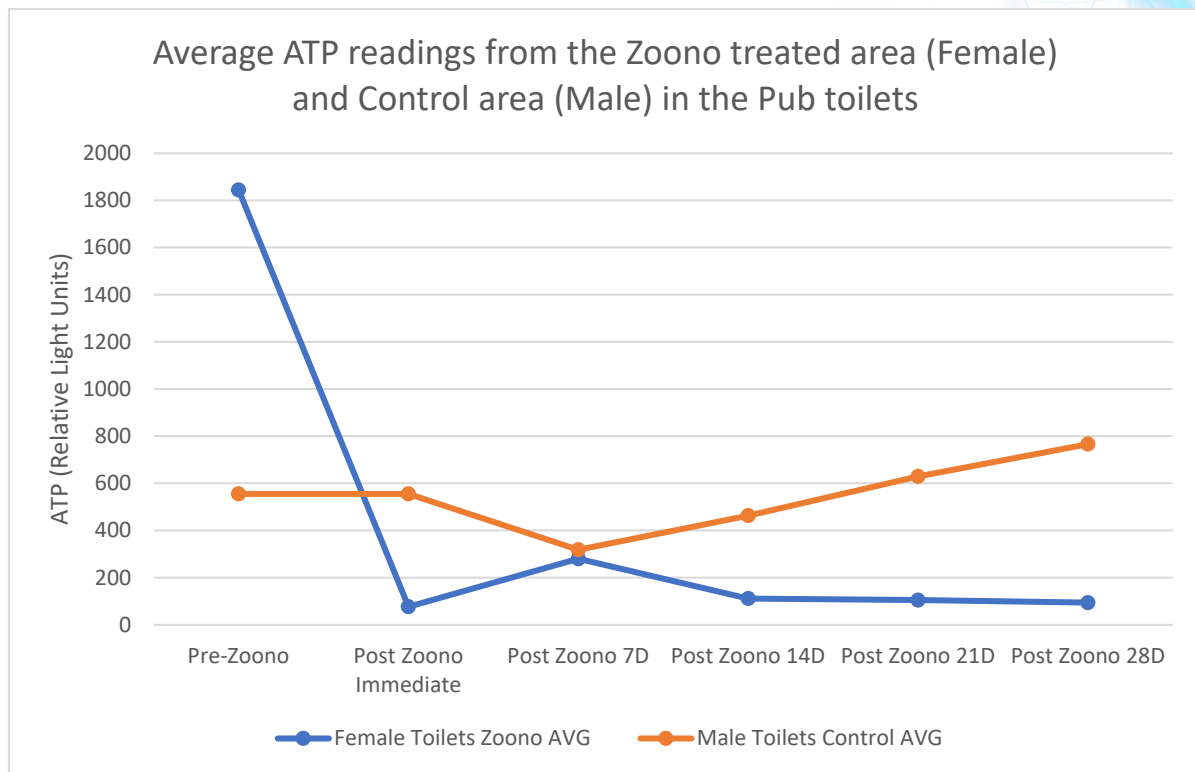


Graph E – Main Area (Pub & Gift Shop) average readings from the Zoono treated area (Pub) and untreated control area (Shop).

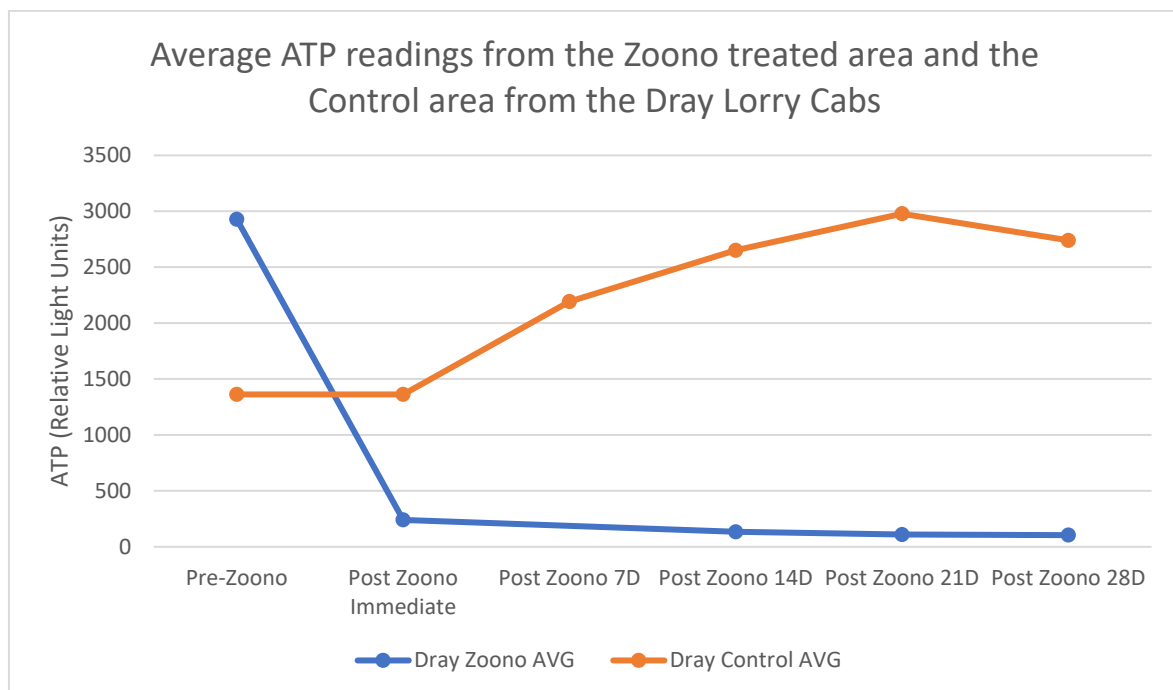




Graph F – Pub toilets average readings from the Zoono treated area (Female) and untreated control area (Male).

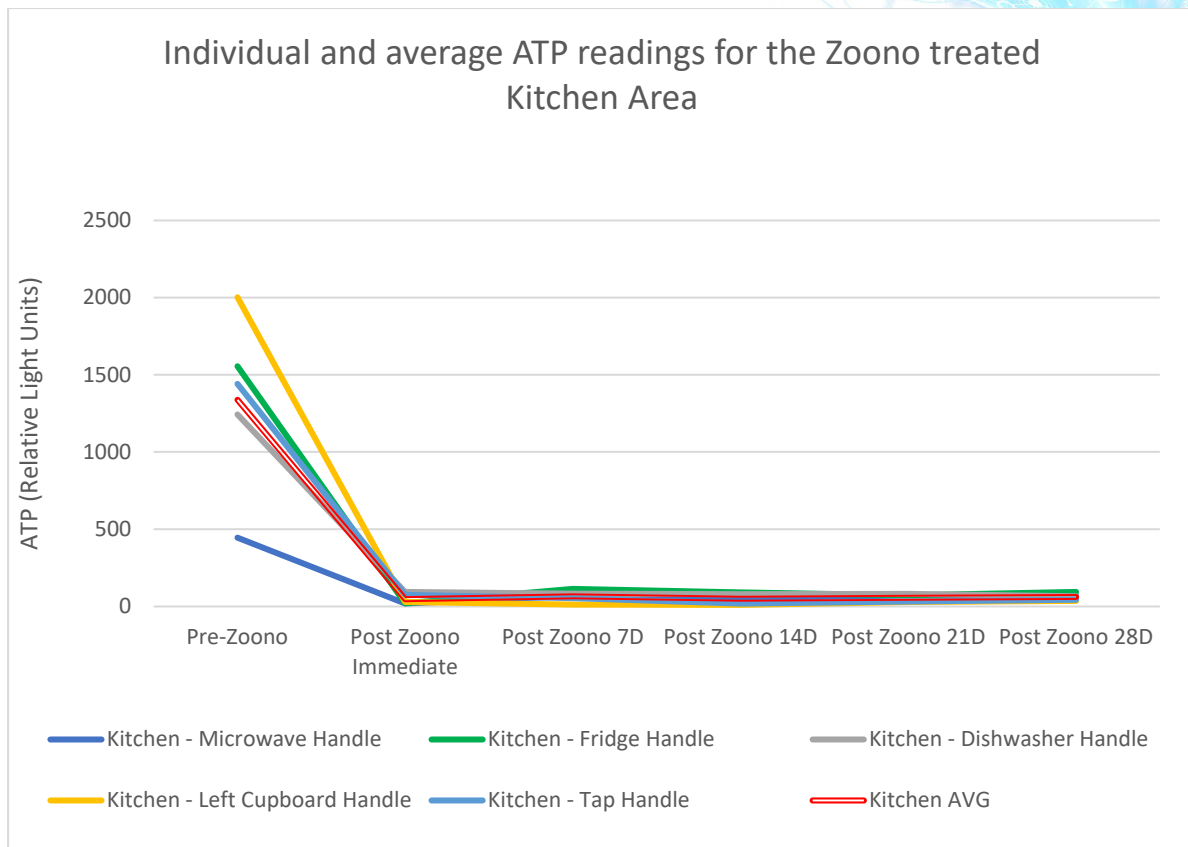


Graph G – Dray lorry cabs average readings from the Zoono treated cab and the untreated control cab.

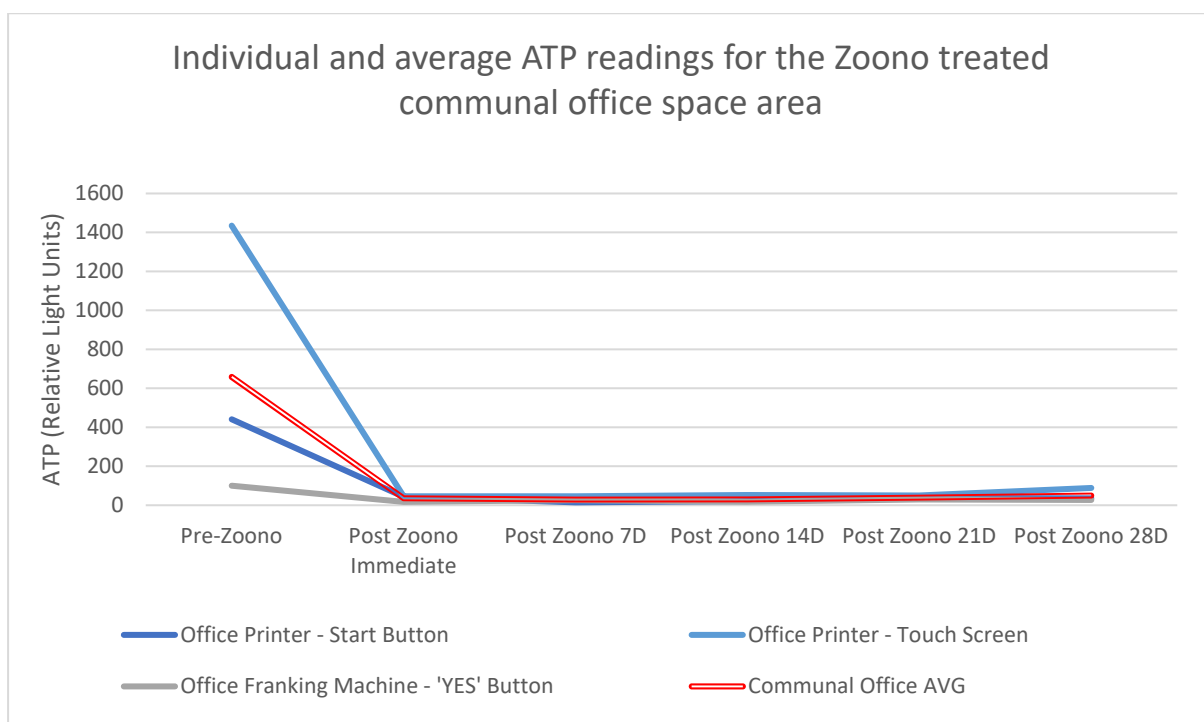


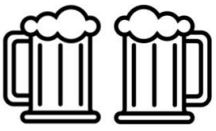


Graph H – Kitchen area individual and average ATP readings for Zoono treatment.



Graph I – Communal office space individual and average ATP readings for Zoono treatment.





Data Discussion

As can be seen from Graph A, which details the average ATP reading from all control areas and all Zoono treated areas, a negative trendline is present for the Zoono treated areas, when compared with the Control areas, which remains largely constant. The average reading for all Zoono treated areas at the end of the 28-day test period was 69 RLU, whereas the average ATP reading for the untreated control area was 1032 RLU. This means that at the end of the 4-week test period, Zoono treated surfaces were, on average, **15 times less contaminated** than the control surfaces. Average reduction in surface contamination from the baseline result to the immediate post-application result is 94.0%. Additionally, a **95.2% reduction in contamination can be seen at the end of the 28-days**.

Graph B showcases a large volume of data, displaying all individual ATP results for Zoono treated areas across the 28-day study period. However, it helps depict the ability of Zoono to perform across the board, showing drastically reduced levels of surface contamination compared to both the baseline results for each location, as well as at the control area averages depicted in Graph A.

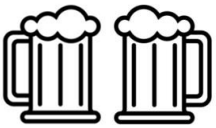
Graphs C - G show consistent results from the individual areas tested, summarising average ATP results from each area. The full set of raw data can be seen in Appendix 1, attached to this report. However, in each instance for the control area and the Zoono treated area, as similar as possible locations were tested in order to ensure results were comparable between the two data sets. For example, in Office A one desk was selected for the control area, and one desk was selected for the Zoono treated area. For both desks the following locations were analysed: keyboard, mouse, phone handle, phone buttons, desktop, and exit/entry handle (either side of the same door – one treated, one control). All of Graph's C - G show drastically improved levels of surface sanitation in comparison to their control 'counterparts'. It is particularly useful to be able to assess each Zoono-treated environment to a control environment that experiences similar levels and styles of use and is therefore directly comparable.

Graphs H & J show both individual results and average ATP results for the communal kitchen area (in the staff offices) and the communal office space. These areas did not have control comparison areas, and so the initial baseline reading must be utilised as representative for the approximate level of surface cleanliness that would have been achieved without the use of Zoono. These areas are also considered important given they are communal areas and therefore represent one of the highest risk areas from cross contamination between staff.

As can be seen from several graphs (A, C-F), a decrease in ATP levels is evident at day 7, before the level of surface contamination rises back to a level similar to that of the baseline readings. It is possible this is the result of the Hawthorne Effect. This is a well-documented phenomenon whereby an individual or group of individuals partaking in a study alter their behaviour due to their awareness of being observed. In this instance, staff members were aware of the study being conducted and were present at the time of initial readings being taken. As a result of this, additional effort may have been applied in keeping areas clean and tidy during the first week of the trial.

Observations

- Average readings from all Zoono treated surfaces were 15 times less contaminated than control area surfaces.
- A reduction of 95.2% in surface contamination was seen from average baseline readings from all Zoono treated surfaces, compared with the average result at the end of the 28-day test period.
- Significant reduction in levels of surface contamination across all test locations, including communal areas which pose significant risk for cross contamination of germs between staff.



Case Studies: Absenteeism

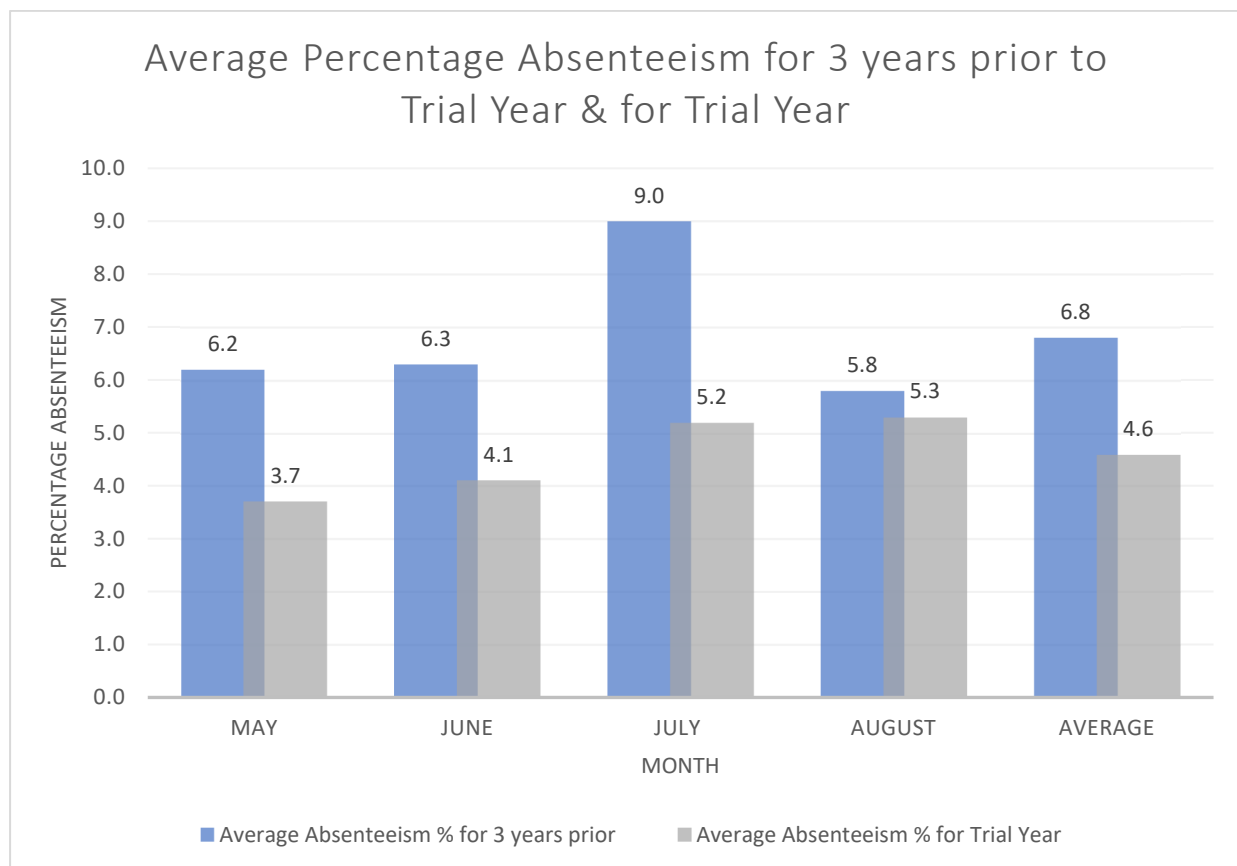
Test Set Up

During the winter months of 2015, a trial was completed for a major international insurance company in Auckland, New Zealand. The 100-seat call centre received wall mounted hand-sanitiser for application of Zoono Hand Sanitiser at the start of each working day. Also, all working areas were treated with Zoono Z-71 Surface Sanitiser via fogging at 20 microns, areas included workstations, staff equipment and communal areas.

The success of the trial on the levels of absenteeism within the company were determined by comparing the absenteeism rate over the trial-winter with the absenteeism rates for winter from the previous three years (2012, 2013, 2014).

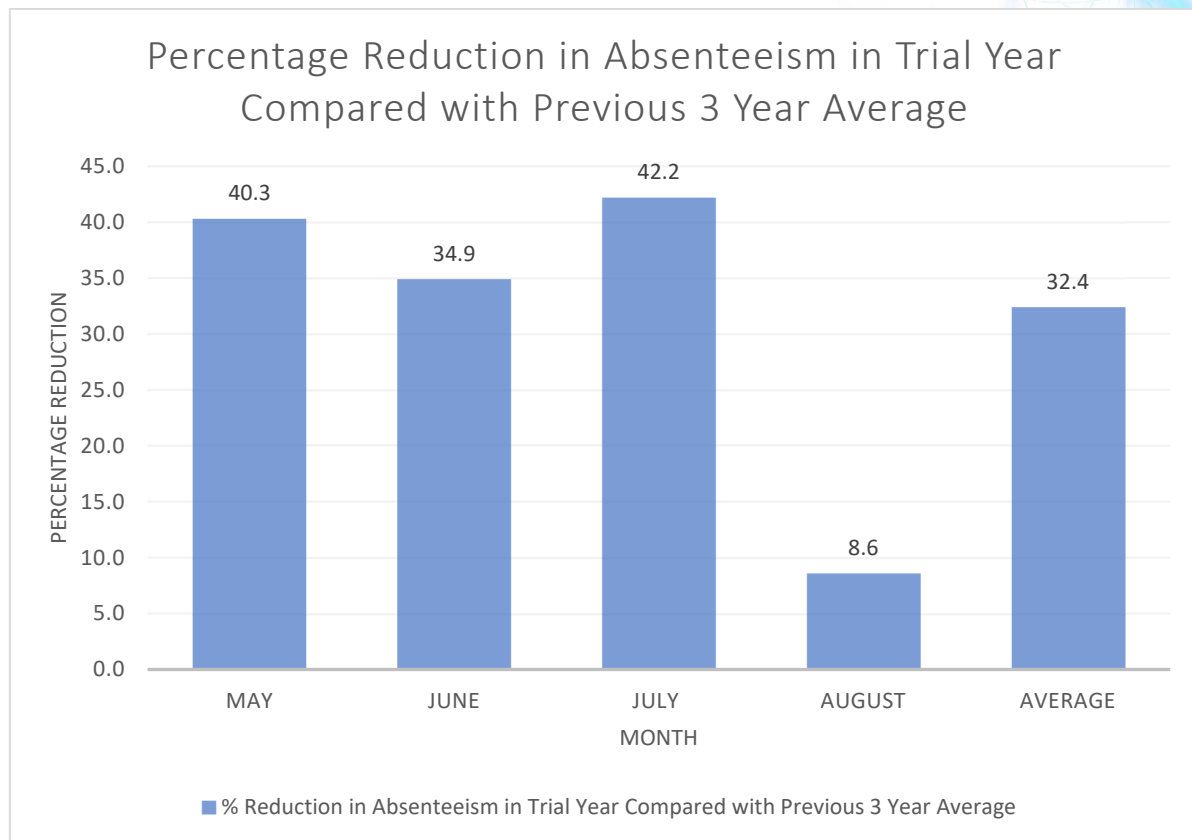
The Data

Graph 2 – The Average Percentage Absenteeism for the 3 years prior (2012, 2013, 2014) to the trial year (2015) in blue and the Percentage Absenteeism for the Trial year where the workplace was treated with Zoono Surface Sanitiser & the staff given Zoono Hand Sanitiser





Graph 3 – The Percentage Reduction in Absenteeism in the Trial Year (when utilising Zoono products), compared with the previous 3 year average for absenteeism.

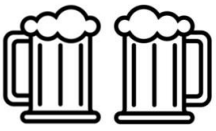


Data Discussion

Graph 2 shows the average percentage absenteeism for the 3-year average during winter prior to the trial winter (blue bars). This was accepted as the typical level of absenteeism during these months for the purpose of the trial. During the trial months, where Zoono was utilised (grey bars), the absenteeism percentage can be seen to be significantly lower than the average for the three years previously. The average level of absenteeism during the 3-year average is nearly 1.5x greater than the absenteeism during the trial winter.

Graph 3 shows the percentage reduction between the three years prior and the trial year. The overall average reduction in absenteeism through the winter months when using Zoono was 32.4% when compared with the previous 3-years. The highest reduction in absenteeism is 42.2% in the month of July. When comparing the reduction in absenteeism with just the previous July (2014) there was a reduction of 56.9% (12.13% absenteeism in 2014 compared with 5.23% absenteeism in 2015).

The use of Zoono products within the workplace does not negate for any false sick-days, where those members of the team off 'sick' are not genuinely unwell. If these factors could be accounted for, it is expected that the actual reduction in absenteeism as a result of genuine illness would likely be greater.



Observations

- Average absenteeism reduction of 34.2% when using Zoono products, compared with average absenteeism from previous 3 years
- Reductions in absenteeism as high as 42.2% can be seen when using Zoono, compared with the previous 3 years
- When compared with the previous year's absenteeism, reductions of up to 56.9% can be seen, which has potential for a huge increase in productivity and subsequently be more cost efficient

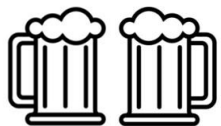
Cost Efficiency

It is estimated that in the UK, workplace absence can cost businesses £29 billion/year. It has been established that employers investing in their workplace health and wellbeing can expect to receive increases performance and productivity from its workforce (Employee Benefits, 2018). Some employer consequences of absenteeism include decreased productivity, increased costs and higher resultant pressure on employees working without a full team. A study conducted within a multi-department site found cost reduction of approximately £9,500/month (across 6,000 sqm) when using Zoono. Another study conducted at a much larger site (approx. 93,000 sqm) found savings of 13% per month (£118,000) when compared with their previous cleaning routine.

Conclusions

Overall, a significant reduction in surface contamination can be identified across all tested areas in the Brewery trial. As can be identified from Graph A, a trend that continues through all data, a 15 times reduction in surface contamination can be achieved via the deployment of Zoono surface sanitiser. Based on these results, a 4-weekly application cycle would be recommended to ensure optimal protection of colleagues, patrons, and visitors. Revolutionising the way surfaces are protected with Zoono's antimicrobial technology can help prevent the spread of potentially harmful germs within the home and workplace. Given health, disinfection and personal protection has been catapulted to the forefront of the media over the last year, there is no better time to invest in advancing both personal safety and the safety of colleagues, patrons, and visitors.

It would be of benefit to employ the use of Zoono Hand Sanitiser within the workplace for staff to use at the beginning of each day, also making the product readily available for patrons and visitors to use upon entry. This would further help reduce the spread of germs via high touch point areas and skin-to-skin contact. Zoono Hand Sanitiser should be used in conjunction with good hand hygiene to remove large particles that can block the Zoono antimicrobial layer from being able to work.

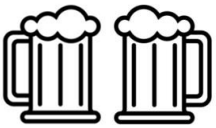


Appendix 1

Raw Data

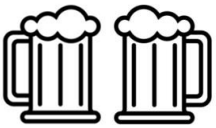
ZOONO TREATED AREAS

Test Area	Location	Pre-Zoono	Post Zoono D0	Post Zoono 7D	Post Zoono 14D	Post Zoono 21D	Post Zoono 28D
Office A	Keyboard	1689	197	69	48	22	90
	Phone (handle)	2525	120	56	102	81	64
	Phone (Buttons)	1211	80	39	31	10	21
	Desktop	1612	69	109	30	111	54
	Exit Handle	581	18	2	9	47	49
Office B	Keyboard	458	50	83	NA	58	93
	Phone (handle)	479	30	43	38	48	49
	Phone (Buttons)	604	34	11	19	18	31
	Desktop	590	43	93	71	40	53
	Exit Handle	813	0	192	84	70	81
Main Pub Area	Exit Handle	1150	19	71	12	31	44
	Wherry Tap Handle	174	63	27	94	77	68
	Conquest Tap Handle	331	12	40	66	70	74
	Countertop	917	14	210	22	45	30
	Till Buttons	3114	170	190	40	36	51
	Card Machine Buttons	651	69	125	51	62	59
Female Toilets	Hot Tap, Closest to door	5880	40	437	201	179	182
	Exit Handle	663	69	323	72	78	68
	Toilet Lock	428	156	233	111	90	44
	Main Entrance Handle	405	42	126	60	71	81
Dray Lorry Z	LHS Steering Wheel	2492	189	NA	161	190	140
	RHS Steering Wheel	2345	609	NA	279	121	138
	Gear Stick	2841	82	NA	70	77	62
	Interior Door Handle	1905	86	NA	55	60	68
	Window Button/Handle	5055	234	NA	101	98	113
Kitchen	Kitchen - Microwave Handle	445	19	68	52	71	69
	Kitchen - Fridge Handle	1555	20	113	90	72	94
	Kitchen - Dishwasher Handle	1244	93	82	79	81	66
	Kitchen - Left Cupboard Handle	2002	28	12	10	28	35
	Kitchen - Tap Handle	1442	75	53	18	31	43
Communal Office Area	Office Printer - Start Button	441	43	15	21	37	35
	Office Printer - Touch Screen	1435	46	46	52	50	88
	Office Franking Machine - 'YES' Button	100	17	26	18	29	27
	Overall AVG	1442	86	103	68	66	69

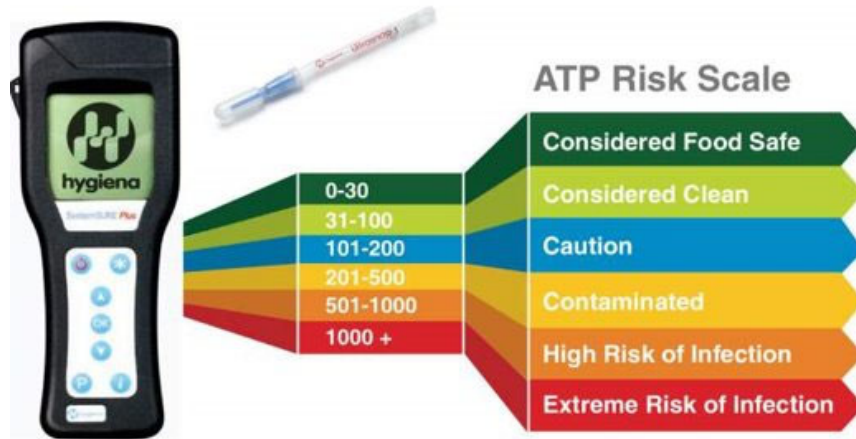


CONTROL AREAS

Test Area	Location	Day 0	Day 7	Day 14	Day 21	Day 28
Office A	Mouse	298	126	153	176	201
	Keyboard	625	81	269	301	289
	Phone (handle)	356	272	381	200	318
	Phone (Buttons)	995	91	325	461	404
	Desktop	1758	165	265	138	362
	Exit Handle	2273	96	981	1116	1059
Office B	Keyboard	1477	306	NA	708	640
	Phone (handle)	393	125	291	401	586
	Phone (Buttons)	853	170	302	275	248
	Desktop	562	93	173	155	190
	Exit Handle	728	364	542	971	846
Pub Gift Shop	Exit Handle	1476	967	1269	1117	1366
	Fridge Door Handle LHS (Closest to door)	706	163	184	366	273
	Fridge Door Handle RHS (Closest to door)	814	276	288	602	804
	Countertop	1153	335	204	392	154
	Till Buttons	1302	331	698	1508	1198
	Card Machine Buttons	389	430	703	450	867
Male Toilets	Hot Tap, Closest to door	692	400	790	638	1416
	Exit Handle	118	505	387	789	679
	Toilet Lock	855	50	211	460	203
Dray Lorry C	LHS Steering Wheel	2140	1816	2876	5593	4950
	RHS Steering Wheel	1053	5599	4480	3931	3884
	Gear Stick	913	1849	1701	1238	2047
	Interior Door Handle	1936	915	430	1321	869
	Window Button/Handle	769	781	3765	2804	1945
	Overall AVG	985	652	903	1044	1032



ATP Risk Scale



ATP testing was used to decipher the surface contamination levels. ATP is a commonly accepted method of testing surface contamination in many industries including Food Production & Healthcare. ATP detects the presence of Adenosine Triphosphate which is a molecule present in all living organisms in the measure of 'Relative Light Units'. The main drawbacks are the lack of specificity of the ATP reading (as it does not decipher between types of germs and cannot differentiate ATP from microorganisms, animals or plants). However, it is used widely and accepted as an estimation of surface contamination and is the only point-of-testing result that can be easily achieved & compared between industries at this time.

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Rawlinson, S., Ciric, L. and Cloutman-Green, E. (2020) COVID-19 pandemic – let's not forget surfaces. *The Journal of Hospital Infection*. 105 (4), 790-791.