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LHTIO Project No: CEF-GXO-01

Date: 06/12/2021
Report No: CEF-GXO-01

Lightico were asked to carry out an air quality audit to determine if CleanLight could provide a solution to allow GXO to once again accommodate all the systems staff in one office (pre-social distances changes) and return use of the rest room back to the drivers.

Summary:

Lightico Limited supplies Titanium Dioxide (TiO_2) photocatalytic LED light panels that are designed to produce antimicrobial activity in the area around the light panel during operation.

GXO provide warehousing and e-commerce operations in the UK. The site Lightico visited provide logistics for Waitrose. They have two sites in Milton Keynes. The one Lightico visited is 330k sq ft and the second is much larger at 1mil+ sq ft.

The objective of the Lightico Air Quality Audit is to identify areas within an environment where the potential risk of onwards transmission of disease is greater and/or where the quality of air, due to potentially raised level of pollution and pollutants is poor, leading to negative consequences for staff and visitors.

Measurements:

To establish air quality Lightico's audit measures the following:

- Background airborne bacteria – Total Viable Count (TVC)
- PM 2.5 – micrograms per cubic meter (ug/m^3)
- PM 1.0 – micrograms per cubic meter (ug/m^3)
- PM 10 – micrograms per cubic meter (ug/m^3)
- Formaldehyde (HCHO) – milligram per cubic meter (ug/m^3)
- Volatile Organic Compounds (TVOC) – micrograms per cubic meter (ug/m^3)

Lightico also provides an overall Air Quality Index based on the above measurements.

Methodology:

Background airborne bacteria is measured through the collection of viable bacteria using the 1/1/1 method for passive air sampling. This refers to the exposure of 18ml of nutrient agar contained in a 100mm diameter petri dish, 15mm deep for 1 hour. The dish is suspended 1m from the floor on a stand positioned 1m from the wall. 1 hour, 1m from the floor, 1m from the wall.

This ensures that whatever settles onto the plate during the 1-hour exposure period is from the air not contamination from surfaces or people. Lightico sample up to 3 separate locations with a room so that an average can be provided.

Once the plate has been exposed for 1 hour it is sealed and then incubated for 72 hours before a Total viable count (TVC) is made of the bacteria identified. This gives a quantitative estimate of the concentration of microorganisms such as bacteria, yeast, or mould spores in a sample. The count represents the number of colonies forming units per g of the sample.

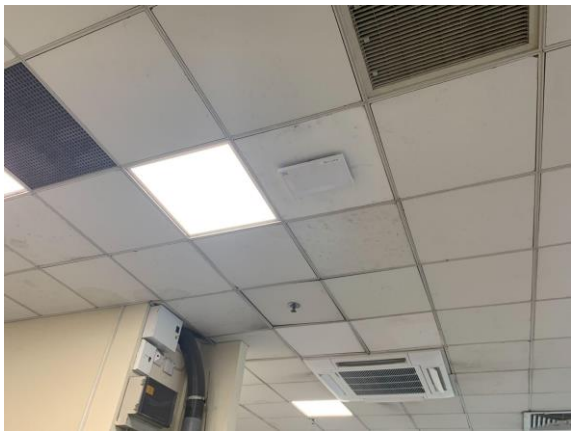
The remaining measurement is conducted using a handheld air quality meter. After allowing the meter to calibrate itself to the environment (taking approximately 5-10 mins) a numerical reading is taken for each of the measurements at 10 min intervals at each of the sample locations. The results are recorded in a table along with the Air Quality Index (AQI).

Environmental observations including air handling and ventilation:

The requirement for any organisation responsible for the health, safety and wellbeing in a building under the law is clear and has not changed due to the recent COVID-19 pandemic. The following statements are set out by the Health and Safety Executive and UK Health Security Agency.

- All workers have a right to work in places where risks to their health and safety are properly controlled.
- The law says employers must make sure there's an adequate supply of fresh air (ventilation) in enclosed areas of the workplace. **This has not changed during the pandemic.**
- **Let fresh air in if you meet indoors.** Meeting outdoors is safer
- Control measures such as avoiding certain activities or gatherings, restricting or reducing the duration of activities, providing ventilation breaks during or between room usage should be considered alongside ventilation for reducing the risk of airborne transmission.

It was noted that although there was a ventilation system this wasn't being used. Supply and return air grilles are installed in the ceiling. The visual inspection concluded no airflow and that they had not been cleaned for some time. An air conditioning unit was installed and operating which was providing recirculated air to the office area.



Ceiling installed air grilles & AC unit

Main office ceiling layout and desk spacing

A portable air cleaning device was operating in the main office, given its location and size, it is estimated this unit would have an effective area of between 35 - 50m2 as long as it was regularly maintained.

The lighting in the main office was LED and seemed adequate, although no lux readings were taken. The room appeared well lit with plenty of natural light.

The putting on office appeared to have no dedicated source of ventilation and was lit via legacy fluorescent tubes, blinds were drawn in this office and the windows do not open.

There were two side offices with an individual working in each of them. The doors remained open during my time on site.

During our conversation with the putting on team. It was mentioned that during busier periods (quiet on the day of our visit) drivers often wait outside and can cue in the corridor. No measurements or readings were taken in this area, but it was mentioned little or no social distancing would take place while drivers are in the queue. The corridor is currently lit using LED panels.

Background airborne bacteria – Total Viable Count (TVC) Sampling Results:

1. GENERAL INFORMATION

1.1 Test Laboratory

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Llannon, Llanelli,
Wales, SA14 6AE

Telephone: 0113 4607102

Client
GXO
C/O CEF Bletchle
5 Drew Ct,
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Milton Keyenes
MK6 4AE

Telephone: 01908 270370

1.2 Test Schedule

Sample collection:	29 November 2021
Incubation of plates:	03 December 2021
Plate reading (colony counting):	06 December 2021

2. MATERIALS AND METHODS

2.1 Culture media and other consumables

The following commercial culture medium was used:

Tryptone Soya Agar (LabM; LAB011) – TSA

TSA plates were prepared in accordance with the manufacturer's instructions and the DWS Media Preparation Manual.

2.2 Sampling procedures (settle plates)

2.2.1 Prepared 100 mm plates of sterile TSA were supplied by Darwin Biological to Lightico.

2.2.2 Lightico's representatives were responsible for the exposure of agar plates to monitor airborne bacteria.

2.2.3 All samples were collected in the putting on admin area at the GXO site in Milton Keynes

2.2.4 In each area selected for sampling, corresponding settle plate samples were collected as follows:

29 November 2021

2.2.5 In each area, airborne bacteria were collected using TSA settle plates: lids were removed, and the agar surface was exposed for 60 minutes.

2.2.6 Following sampling, plates were returned to the Test Laboratory on 29 November 2021

2.2.7 Incubation and evaluation of agar plates

2.3.1 At the Test Laboratory, all returned TSA plates were placed in an incubator at 30°C ±1°C for 72 hours.

2.3.2 After incubation, bacterial colonies on each TSA plate were photographed and enumerated.

3. RESULTS AND DISCUSSION

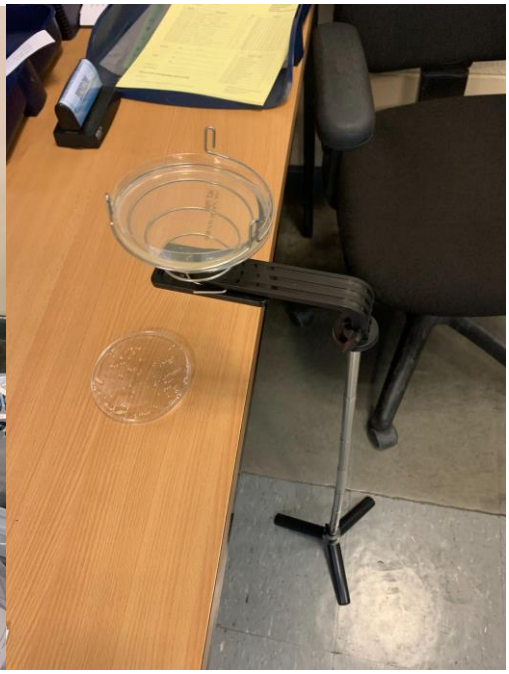
3.1 Sample descriptions provided by Lightico, and the corresponding colony counts on each agar plate are presented in Table 1.

3.2 Photographs of the agar plates are presented in appendix A

Table 1 Bacterial colony counts on settle plates at each location

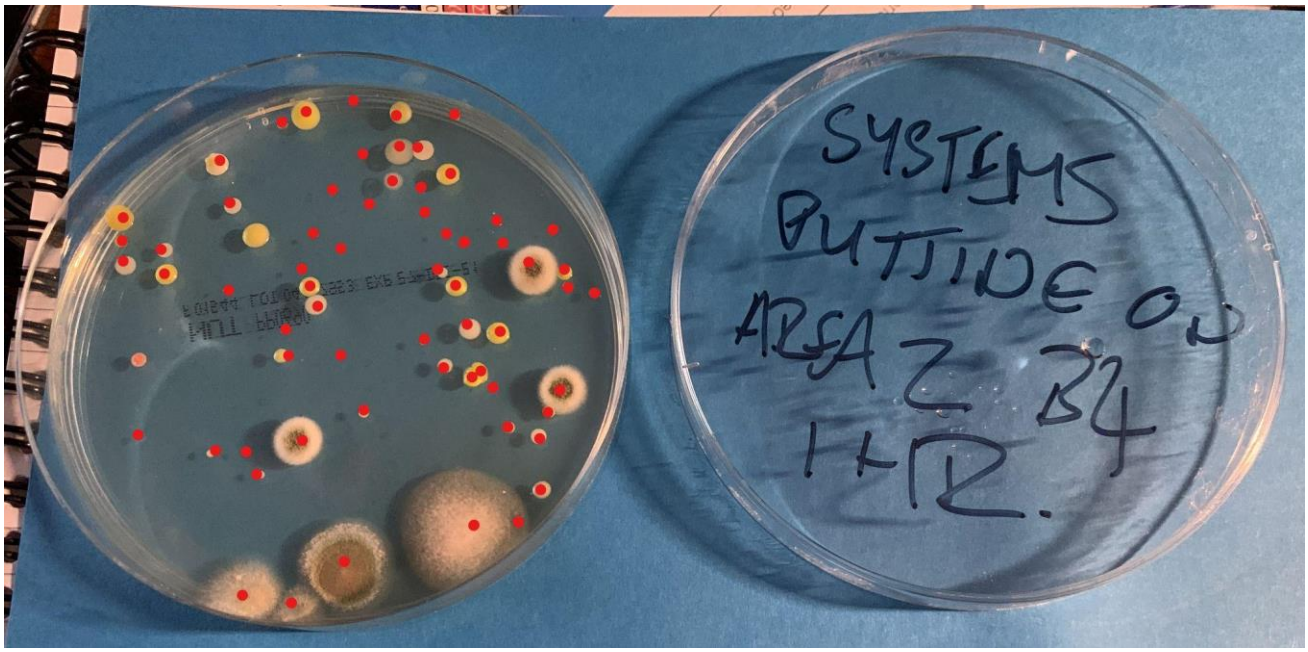
Plate location	Bacterial colony count (per plate) - TVC
Putting on Area - Location 1	64
Main Office - Location 1	112
Main Office - Location 2	94
Main Office - Coffee Machine	73
Goods in Entrance	53

Agar plate collection - Putting On Area

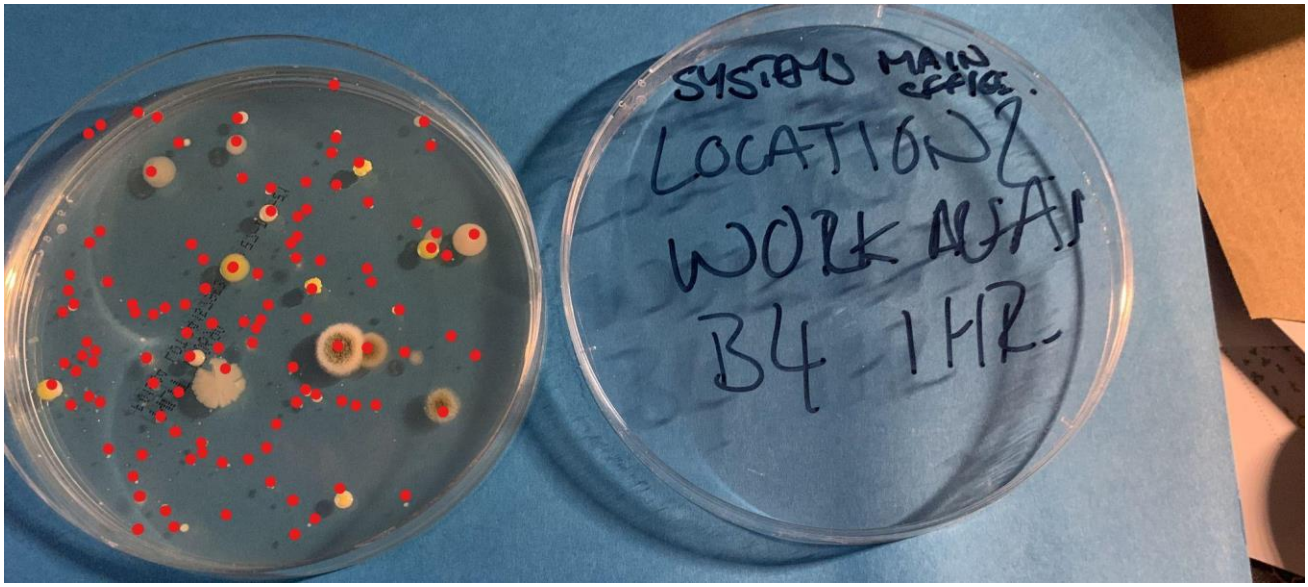


Agar plate collection - Main Office

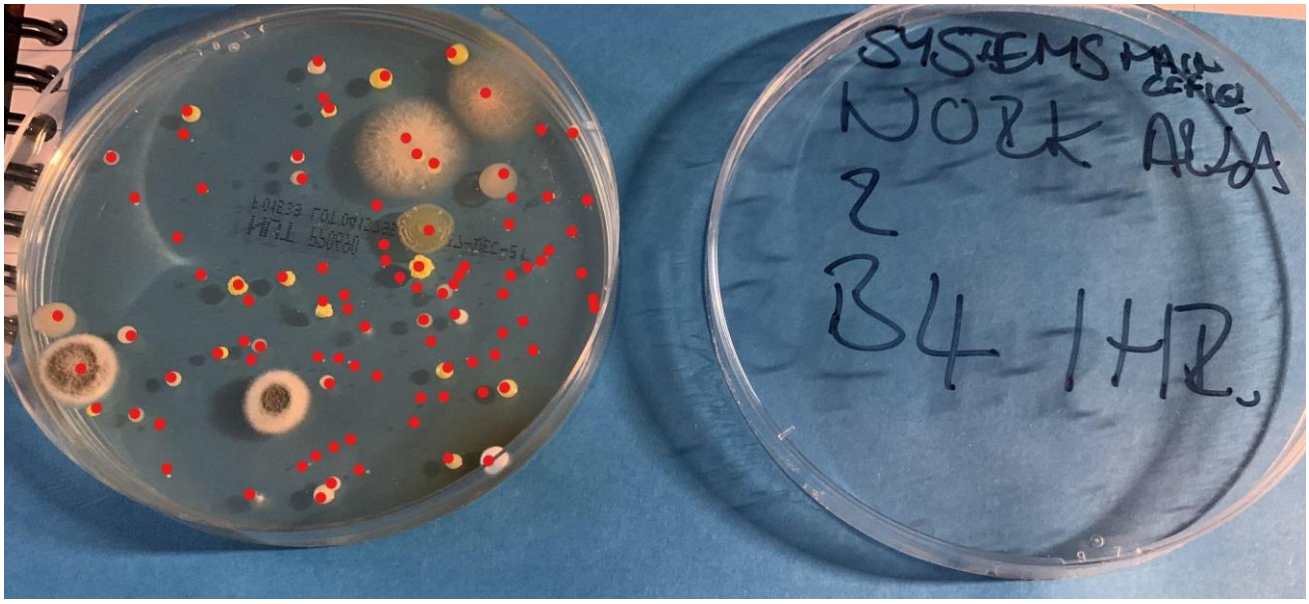
Appendix A - Photographs of the agar plates



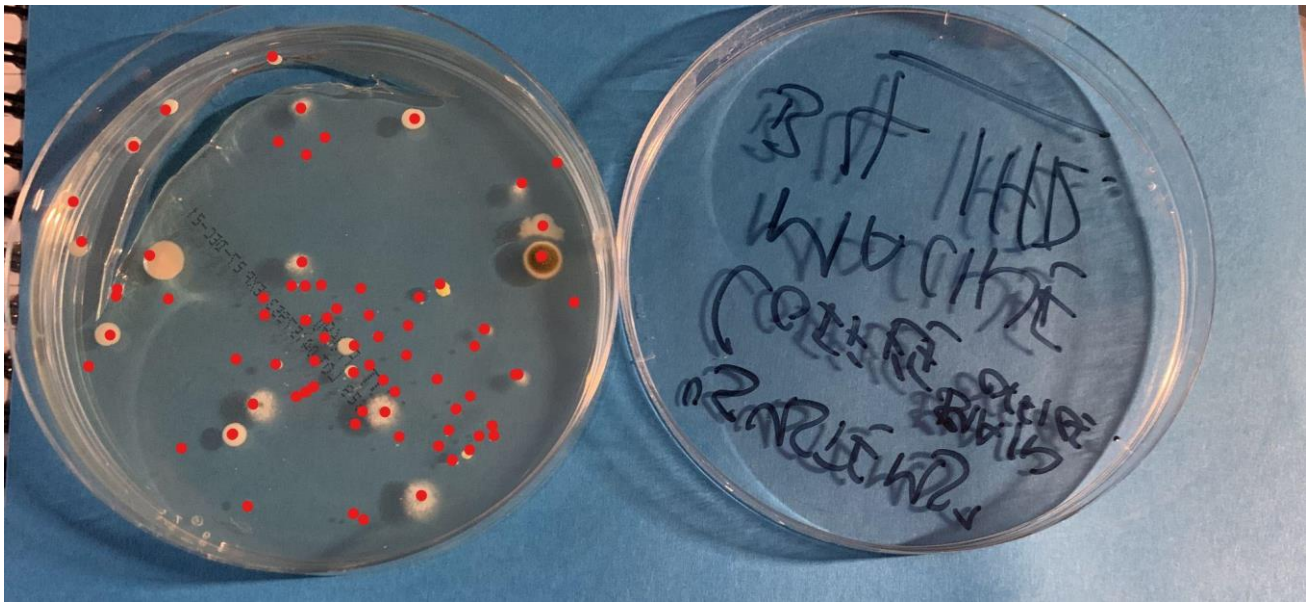
Putting on Area



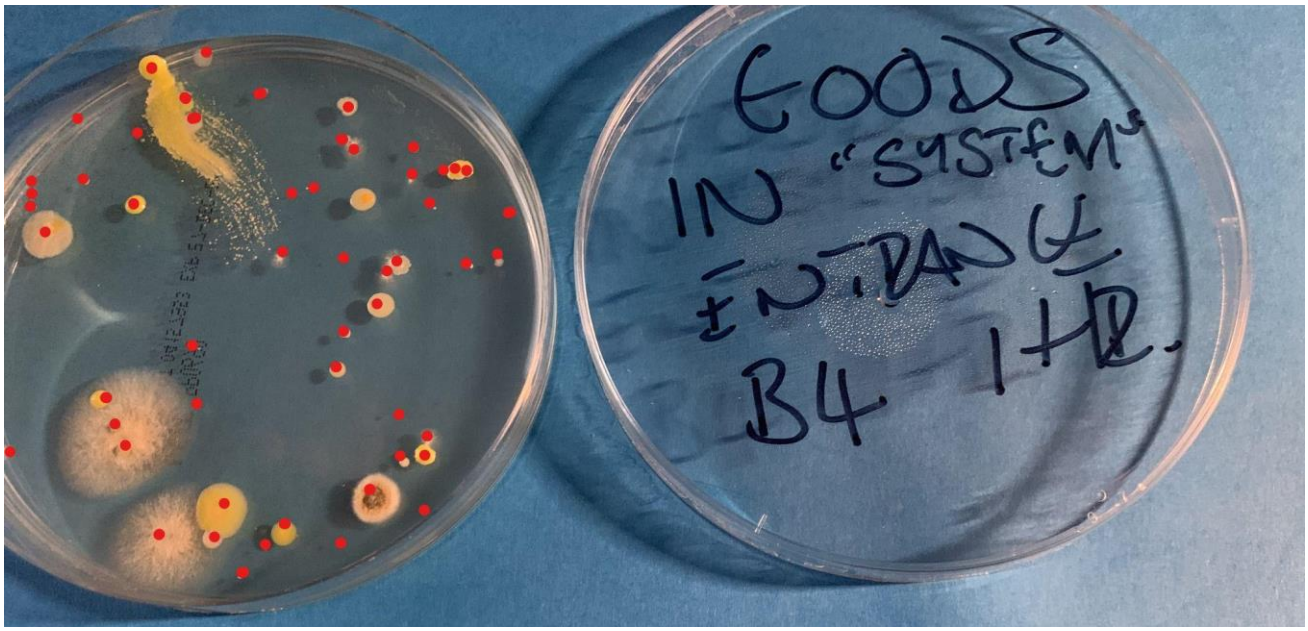
Main Office - Location 1



Main Office - Location 2



Main Office -Coffee Machine



Goods in Entrance

Further Sampling Results:

PM 2.5 – micrograms per cubic meter (ug/m^3)
PM 1.0 – micrograms per cubic meter (ug/m^3)
PM 10 – micrograms per cubic meter (ug/m^3)
Formaldehyde (HCHO) – milligram per cubic meter (ug/m^3)
Volatile Organic Compounds (TVOC) – micrograms per cubic meter (ug/m^3)

	Putting on - 15 min	Putting on - 30 min	Putting on - 45 min	Main Office - 15 min	Putting on - 30 min	Putting on - 45 min
CO2	585	537	568	522	545	553
PM2.5	18	17	17	16	15	14
PM1.0	10	10	10	7	9	8
PM10	22	22	21	18	20	18
HCHO	0.006	0.03	0.01	0.018	0.02	0.02
TVOC	0.039	0.195	0.065	0.126	0.13	0.117

Summary & Conclusions:

From our audit of the area and samples taken, the following conclusions may be drawn:

1. The current level of fresh air ventilation provided to the area is insufficient under health and safety regulations
2. The air quality found in the area does not represent a general risk at this stage based on the pathogens tested, however, the presence of viruses, such as COVID-19 were not measured.
3. The bacteria levels identified indicate higher concentrations in areas where human activity is also the highest.
4. This would indicate that any social distancing actions are not sufficient to reduce the risk of airborne transmission.
5. Without further action to mitigate the risk of airborne transmission the activity currently shared across the 2 offices should not be consolidated back into a single office.
6. Light levels in the putting on office are not sufficient for the work carried out in the space. CIBSE recommendations are for this area to be lit to a minimum of 500lx.

Based on the volume of the room and the required light levels for their use the following lighting and equivalent air change calculations are recommended:

	Estimated equivalent ACH provided by CleanLight Panels				
	Fittings	**EM**	**Area**	**Total m3/s**	**Total ACH**
Main Office	**15**	**500 lx**	**86.40 m2**	**0.3411**	**5.08**
Putting On Area	**6**	**590 lx**	**28.80 m2**	**0.13644**	**6.09**