Study title: Measurement and reduction of airborne levels of xylene in the histopathology laboratory using the AiroCide photocatalytic oxidation technology.

Introduction.

The importance of a clean and healthy working environment is unquestionable. In order to help monitor and maintain safe working environments in areas where volatile organic compounds (VOCs) are routinely used, Surrey Diagnostics offers the following services;

1. An environmental monitoring service for xylene, formaldehyde and glutaraldehyde in the histopathology laboratory.

2. The AiroCide air cleansing system, a new and innovative technology designed to reduce and thereafter maintain low airborne levels of these compounds.

There is much literature on the occupational health implications of elevated airborne levels of VOCs in the workplace, and it is acknowledged that Photocatalytic Oxidation (PCO) is an efficient way to remove VOCs.

Recent studies into the effect of PCO with VOC's record the efficiency in removal of the compounds, but report there has not been an efficient, robust, cost-effective, user-friendly, convenient-sized system. The AiroCide technology, developed in collaboration with NASA, offers a cost effective PCO system in a compact unit.

Method.

Drager tubes were used to measure airborne levels of xylene at four sites in the histopathology laboratory. Measurements were taken at time 0, and then the AiroCide ACS-50 unit was switched on. Subsequent measurements were taken at 2 hours and 96 hours.

Site 1: Entrance to automatic xylene/slide preparation system.
Site 2: Exhaust from automatic xylene/slide preparation system.
Site 3: Manual workbench; xylene slides.
Site 4: Xylene 'dump' station.

Results

Test Site	Distance from AiroCide (metres)	Time			% Reduction
		0h	2h	96h	
1	2	5	5	2	60%
2	1	20	15	10	50%
3	1	6	4	0	100%
4	10	10	3	1	90%

Discussion

1. Sites 1&2 Xylene was detected at the front of the workbench, suggesting not all the xylene produced by the automated slide preparation system was contained by the hood. Also, possibly more importantly, significant levels of xylene were being returned to the laboratory environment from the exhaust vent of the automatic slide preparation system. The recorded level of 20ppm may vary/increase substantially during working day with use of xylene. Levels may increase above the legal limit of 50ppm during such periods. Proximity of technicians at site 1 and at adjacent work station(s) (distance = 2 and 4 metres) to the left of Site 2 are at risk of continuous exposure to 20+ ppm over prolonged periods.

2. Site 3 Manual operations with xylene processes at site 3 present risks from prolonged exposure, which is compounded by the proximity to site 2 (2 metres).

3. Site 4 The manual 'dumping' of xylene liquid produces high airborne levels, which expose the technician to risk on a regular basis. If the door to this area is open the AiroCide will have had an effect on the xylene levels present. If the door remains closed, a separate unit within this room would be required.

Conclusions

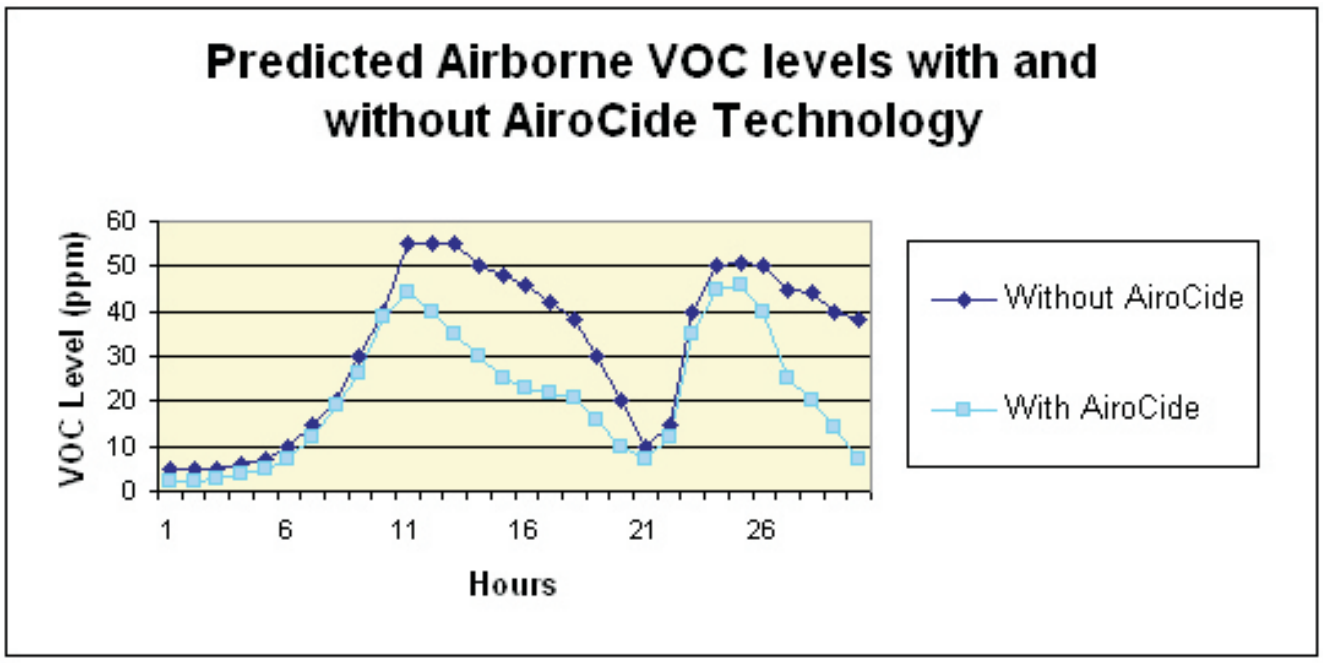
1. 1. Reduction in recorded airborne xylene level in each of the four sites over 4 day test period. (average reduction of 75%)
2. Reduction in recorded airborne xylene level in 2 hours at site 2.
3. Reduction in ppm xylene was greater at sites where there was a higher initial concentration (see sites 2 and 4).

Discussion

It was seen during the study that xylene was present at easily measurable levels in all parts of the laboratory, with the highest reading of 20 ppm found at the carbon-filter exhaust. It is worth noting that these elevated levels were recorded in an environment that was already managed by an HEPA filtration and HVAC air management system. The AiroCide technology will complement the existing air management system, and contribute to the maintenance of low airborne xylene levels.

It has been noted that the use of 'near-bench' activated-carbon filtration systems are effective in management of xylene and formaldehyde levels in histopathology, 'cut-up' areas, dissection suites and mortuaries. The activated carbon sites in the filter are however limited in number, and whilst managing the air quality in the short term, unless changed/replaced on a regular basis with new filter beds, will not filter any further VOC's from the test air. In fact, measurements of these systems confirm that unless the filters are changed regularly, the system serves to concentrate the VOC near to the technician as the fans drag xylene-loaded air from the surrounding test area, and the rest of the laboratory, past the technician, and over the saturated carbon filter bed, with a consequent concentration of VOC exhausted from the bench system, into the immediate area of the technician.

In the company of the AiroCide technology, the daily variations of airborne VOC's within the laboratory will be better managed; with increases and 'peak' levels being reduced, and these elevated levels being sooner reduced to within acceptable limits.



Since the occupational risk associated with VOC levels relates to "exposure to elevated levels on a routine basis over a prolonged period", the introduction of this new technology provides an effective and necessary complement to traditional methods of air management.

Though this study only involved the measurement of xylene levels, the AiroCide technology has been proven to reduce levels of other harmful VOCs including formaldehyde, glutaraldehyde, benzene, isopropanol and ammonia.

Recommendations

1. Installation of AiroCide ACS-50 immediately adjacent to site 2.
2. Installation of AiroCide ACS-25 or ACS-50 adjacent to site 4.
3. Installation of AiroCide ACS-50 adjacent to site 3.
4. Quarterly monitoring of VOCs in the histopathology laboratory.