

UVAIRX PCO TECHNOLOGY PREVENTS MOLD GROWTH IN CRAWLSPACES OF NEW CONSTRUCTION

**Claude P. Selitrennikoff, Ph.D., Professor Emeritus, University of Colorado School of Medicine; and
Jerrod Keith, Engineering Manager, UVAIRx**

The available science on molds and their potential health effects remains under study, but considerable progress has been made. The U.S. Centers for Disease Control and Prevention (CDC), the Institute of Medicine of the U.S. National Academy of Sciences, the World Health Organization and Health Canada all agree that living or working in a building with mold results in increased risk of respiratory disease.

-American Industrial Hygiene Association
Full "Facts About Mold" article available at www.AIHA.com

ABSTRACT AND EXECUTIVE SUMMARY

Mold remediation in new residential construction is an increasing economic and health issue. It is estimated that in certain areas, upwards of 20% of new homes could require remediation within one year (Joseph Gifford, Certified Industrial Hygienist, personal communication). Efforts in the construction industry are ongoing to prevent mold growth in crawlspaces during all stages of construction.

In collaboration with ASR Companies, a national, production builder and UVAIRx, an eight-week test of the effect of UVAIRx's photocatalytic oxidation (PCO) technology on mold prevention in crawlspaces during the construction process was conducted. The UVAIRx units were installed once the floor sheathing had been laid over the crawlspace and left in place until drywall had been completed. Samples from crawlspace surfaces in four houses under construction were obtained as were samples of the ambient air. Two houses had UVAIRx PCO units installed in the crawlspace (Treated Crawlspace), while two did not (Untreated Crawlspace). All surface samples were brought to a laboratory and aliquots placed on agar-solidified medium to identify viable mold spores.

ANALYSIS REVEALED SEVERAL KEY OBSERVATIONS REGARDING NUMBERS OF MOLDS

- There were significant differences between samples obtained from the surfaces of Treated vs. Untreated Crawlspaces.
- There were significant differences between air samples obtained from Treated vs. Untreated Crawlspaces.
- Importantly, samples (both surface and air) from Treated Crawlspaces had significantly fewer viable molds than those from Untreated Crawlspaces.

SUMMARY

Taken together, these results demonstrate that UVAIRx PCO units significantly and dramatically reduced viable fungi in crawlspaces during the first 8 weeks of construction. It is anticipated that the inclusion of UVAIRx PCO units during construction will reduce or eliminate the need for mold remediation.

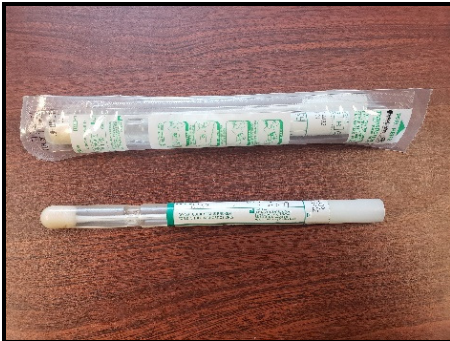
MATERIALS AND METHODS

UVAIRx PCO Unit Installation:



A single UVAIRx Ux105 unit was securely fastened with tamper-resistant fixtures in each of the crawlspaces at the treated construction sites and power was supplied from the temporary construction power meters present at each site. Each site was inspected on at least a weekly basis to ensure that the units were properly functioning.

Surface Samples:



Surface samples in each crawlspace were taken at weekly intervals using HealthLink TransPorter Sterile, Sealable, Transport Swabs. Collection swabs were rubbed on a selected 4" x 4" area for 30 seconds, replaced in the collection tube, and samples kept chilled until incubated. In addition, floor joists, foundation walls, and crawlspace floors were inspected for visible signs of mold on a weekly basis.

Collection swabs were opened under sterile laboratory conditions, and one mL of sterile distilled water was added to each sample tube. The tubes were mixed using a vortex mixer for 10 seconds and 100 uL of the resulting solution placed on the surfaces of Potato Dextrose Agar medium (PDA) in 100-millimeter (mm) Petri dishes. The resulting dishes were incubated for 3 to 5 days at ambient temperature. After incubation, the numbers of mold colonies on each plate were determined by visual inspection.

For the determination of ambient air mold spore levels, sterile PDA-containing petri dishes were exposed to the ambient air in each crawlspace. Petri dish lids were removed for 30 minutes, after which the lids were replaced, and the dishes incubated for 5 days at ambient temperature. The number of mold colonies on each plate was determined by visual inspection.

RESULTS

As described above, surface samples were obtained from two Treated Crawlspace and two Untreated Crawlspace and the number of mold colonies recorded. These results are summarized in Table 1.

Table 1

Mold Colonies - Surface Sample Tests										
Week	0	1	2	3	4	5	6	7	8	Total (weeks 6-8)
Collection Date	4-9-19	4-16-19	4-23-19	4-30-19	5-7-19	5-14-19	5-21-19	5-28-19	6-4-19	
Treated #1 w/ concrete rat slab	0	0	0	0	1	0	0	2	0	2
Treated #2 w/ concrete rat slab	0	0	0	0	2	0	2	0	0	2
Untreated #1 w/ plastic vapor barrier							3	2	>100	105
Untreated #2 w/ concrete rat slab							10	18	4	32

Several points are noteworthy:

- First, the number of viable molds from the surfaces of the Treated Crawlspace remained essentially unchanged and very low over the course of the eight-week test period.
- Second and importantly, the number of viable surface molds in Treated Crawlspace is significantly less than those present in Untreated Crawlspace.

Air samples were taken in the Treated Crawlspace and Untreated Crawlspace, as well as outdoor air, and the number of mold colonies determined. These results are summarized in Table 2.

Table 2

Mold Colonies - Air Sample Tests			
Week	7	8	Total (weeks 7-8)
Collection Date	5-28-19	6-4-19	
Treated #1 w/ concrete rat slab	5	3	8
Treated #2 w/ concrete rat slab	0	9	9
Untreated #1 w/ plastic vapor barrier	12	7	19
Untreated #2 w/ concrete rat slab	24	48	72
Outdoor Air	5	13	18

Several points are noteworthy:

- The mold colony numbers in the air from Treated Crawlspace are significantly less than those of Untreated Crawlspace. In addition, mold colony numbers from the air in Treated Crawlspace are less than those from outdoor air.
- The data shows that the air from Untreated Crawlspace had more airborne fungal spores than the outdoor air. This indicates that there was significant mold growth in the Untreated Crawlspace (note the number of mold colonies from the surfaces of Untreated Crawlspace). This is in sharp contrast to the number of airborne fungal spores in Treated Crawlspace vs. outdoor air (8 and 9 mold colonies vs. 18 mold colonies).

DETAILED SUMMARY

In considering the concrete evidence of this trial, it is clear that the UVAIRx PCO units prevented the growth of surface mold in crawlspaces. This evidence is substantiated both in the numbers of mold spores found in the air of Treated Crawlspace versus the Untreated Crawlspace (17 mold colonies vs. 91 mold colonies) as well as the differences in surface mold amounts in Treated vs. Untreated Crawlspace.

To reiterate the effectiveness of the technology, it is important to note that the two Treated Crawlspace had water infiltrating the crawlspaces (standing water from weeks 1-3) and at several time points, the UVAIRx PCO units were found unpowered. These are two crucial variables that could have compromised the outcome of the study and functionality of the UVAIRx PCO units; however, despite these issues, the UVAIRx PCO units significantly reduced both the number of viable molds on the surface of the crawlspace and the number of airborne mold spores. The evidence of this robustness is imperative when anticipating real-world situations that may be encountered during the construction process. The UVAIRx PCO technology should increase the confidence of being protected from crawlspace mold growth during the construction process.