

# **Oxidizer Decontamination of Building Materials Contaminated with Methamphetamine**

By

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## **Introduction:**

Concerns regarding chemical contamination associated with the clandestine production of methamphetamine have been realized for some time.<sup>(1-10)</sup> Work conducted by National Jewish Medical Center Researchers has documented a number of the contaminants generated at clandestine laboratories and the presence of some of these contaminants in actual methamphetamine laboratory investigations.<sup>(11)</sup>

Research conducted by our group has indicated that the contamination associated with these clandestine methamphetamine laboratories does not end when the laboratory ceases operation.<sup>(11)</sup> Simulated methamphetamine cooks conducted by our group have demonstrated that a number of compounds may persist after the cook has been completed. Initial testing revealed that shortly after a clandestine cook, levels of iodine, hydrogen chloride, and methamphetamine were found at the site even though the bulk chemicals may have been removed. The largest contaminant was found to be the drug, methamphetamine, itself. Methamphetamine was found to aerosolize during the salting-out phase conducted during all current production methodologies. It is released as an aerosol and can contaminate most surfaces within a structure.<sup>(11)</sup> Our research also indicated that the methamphetamine continues to be present within the structure for some period of time (months to years).

The levels of methamphetamine found within a structure after clandestine cooks is a factor of the type of cook and the number of cooks conducted. Red phosphorous cooks appear to result in a higher concentration of methamphetamine release than do anhydrous ammonia cooks and multiple cooks will result in a higher contamination level.<sup>(11)</sup> Surface wipes for methamphetamine were collected at suspected methamphetamine laboratories during law enforcement actions. A total of 14 suspected laboratories were sampled with all of the laboratories having at least one sample positive for methamphetamine. The levels of methamphetamine found ranged from a low of 1.0 µg/sample to a high of 16,000 µg/sample. The overall mean methamphetamine contamination level in these suspected laboratories was 511 µg/sample with a median contamination level of 28 µg/sample.

Further research has indicated that simply by using methamphetamine, the drug will be deposited on surfaces within the structure. We conducted a simulated “smoke” using methamphetamine and found that a significant amount of methamphetamine is released during that process. Depending upon how much methamphetamine is used within a structure the mean level of methamphetamine on the walls may range from less than 0.1 ug/100 cm<sup>2</sup> to as high as 5 ug/100 cm<sup>2</sup>. These lower levels of contamination are being more commonly encountered as residences are increasingly monitored for methamphetamine during realty transactions. As low as these levels appear to be, they are normally above the levels that have been promulgated by the states for cleanup.

A previous study using Simple Green as a decontamination agent indicated that the removal rate of methamphetamine from a semi-porous surface ranged from approximately 60% to 80% on the first wash. Subsequent washes resulted in much less

removal with a total removal rate of approximately 80% for three washes. In many decontamination scenarios, an 80% removal rate will not reduce methamphetamine contamination levels to less than the current state standards. Discussions with a number of state regulators indicated that many decontamination firms were using an oxidizer of some type to further reduce methamphetamine contamination on painted surfaces. For this reason, we decided to test the decontamination capability of three cleaning compounds that contained oxidizers. The tests were conducted on drywall surfaces that had been painted with a latex paint.

### **Methodology:**

This study was conducted to determine the impact of washing painted drywall surfaces with a cleaner containing an oxidizing compound. The drywall utilized in this project was 3/8<sup>th</sup> inch gypsum board that was cut into 24" x 24" squares. The drywall was painted with a latex enamel paint by painting the surface with two coats of paint, letting the paint dry and then painting it again with the same latex paint. Good coverage was provided and a gallon of paint was found to cover a total of 16 panels. After the painting, the paint was allowed to dry for a period of at least 2 days prior to contaminating the panels with methamphetamine.

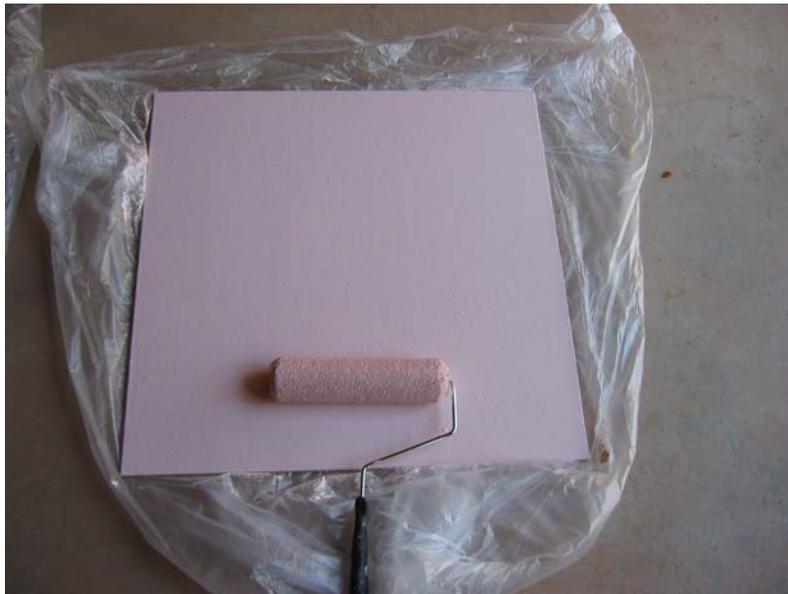


Figure 1. Painting drywall with a base paint prior to contaminating the board in the chamber.

After painting, the drywall panels were put into the chamber for contamination. A total of 9 drywall panels were contaminated on September 21, 2008 using 206 mg of methamphetamine. The methamphetamine was aerosolized starting at 12:40 pm and the

aerosolization was complete at 12:55 pm. The fans in the chamber were run until 2:30 pm and the drywall was removed the next day at 11:00 am after a 3 hour evacuation of the chamber.

Three more panels were contaminated on January 15, 2009 using 277 mg of the same methamphetamine utilized in the September 21, 2008 run. The methamphetamine was aerosolized beginning at 3:50 pm and the fans were turned off at 5:05 pm. The drywall was again removed the next day after a 3 hour evacuation.

The methamphetamine utilized for contamination was a street-manufactured methamphetamine provided by the North Metro Task Force in Colorado. The drug was approximately 77% methamphetamine and also contained small amounts of amphetamine, ephedrine, and pseudophedrine. No MDMA or phenylpropanolamine were found to be present. The methamphetamine was put into a beaker and the chamber was sealed and the methamphetamine aerosolized in the chamber. The methamphetamine was completely aerosolized within a short time (listed above) and the beaker heater was turned off. The fans within the chamber were kept running for another period of time to assure even distribution of the methamphetamine. The chamber was then allowed to sit overnight and the material was removed the next day.

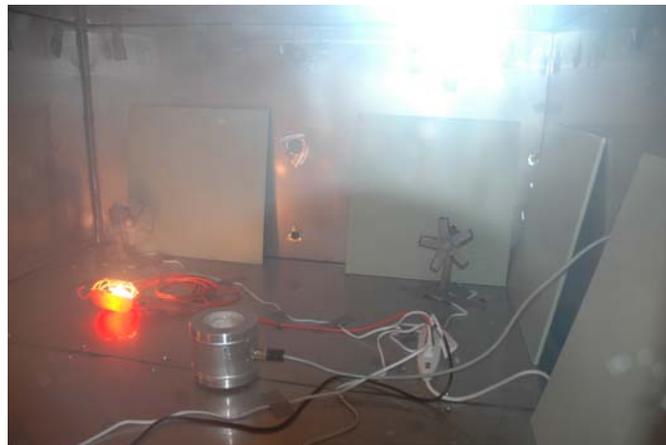


Figure 2. Painted drywall material being contaminated within the chamber.

After the material was removed from the chamber, it was placed in a plastic bag and transported to an area to be pre-sampled, washed, and post sampled.



Figure 3. Drywall being removed for transportation to an area to be sampled and treated.

After being transported, the initial panels were divided into 2 groups of three for testing. The groups were as follows:

- a. Sodium Hypochlorite Cleaner
  - i. One panel was not washed.
  - ii. One panel was washed 1 time and then tested.
  - iii. One panel was washed 3 times and then tested.
- b. Quaternary Ammonia Cleaner
  - i. One panel was not washed.
  - ii. One panel was washed 1 time and then tested.
  - iii. One panel was washed 3 times and then tested.

Five samples were collected prior to treatment and after treatment, resulting in a total of 10 samples being taken from each of the drywall panels. Each sample consisted of a 100 cm<sup>2</sup> area being sampled from the panel using a 3"x 3" cotton swab to which 3 ml of methanol were added. After sampling the wipe was then put into a plastic centrifuge tube and sent to the laboratory for analysis.

For each panel, there were a total of 36 potential 100 cm<sup>2</sup> samples available. The squares sampled were determined using random number generator for each panel using numbers from 1 – 36. The two groups of 5 samples were generated with no replicates and the position of the samples were located on the panel using the following template:

iv.	1	2	3	4	5	6
v.	7	8	9	10	11	12
vi.	13	14	15	16	17	18
vii.	19	20	21	22	23	24
viii.	25	26	27	28	29	30
ix.	31	32	33	34	35	36



Figure 4. Panel prepared for initial pre-sampling after contamination.

After the collection of the pre-samples, the panels were then washed for the prescribed number of treatments using the appropriate cleaner. The cleaner was used according to label directions for a maximum degreasing. The cleaner was applied full-strength from a spray bottle onto the surface of the panel. The cleaner was allowed to sit on the panel for approximately 1.5 minutes and then it was washed off using clean water and a cloth. The surface was not scrubbed hard and no abrasive materials were utilized. After cleaning, the panels were allowed to dry completely before subsequent cleanings or prior to post sampling.



Figure 5. Pictures of the oxidizer cleaners utilized during this experiment.

The 409 cleaner contained 0.3% of alkyl dimethyl benzyl ammonium chloride and the Clorox Clean-Up contained 1.84% of sodium hypochlorite. Both products are manufactured by Clorox Corporation and are sold in retail outlets. The Material Safety Data Sheets for these products are attached to this report.

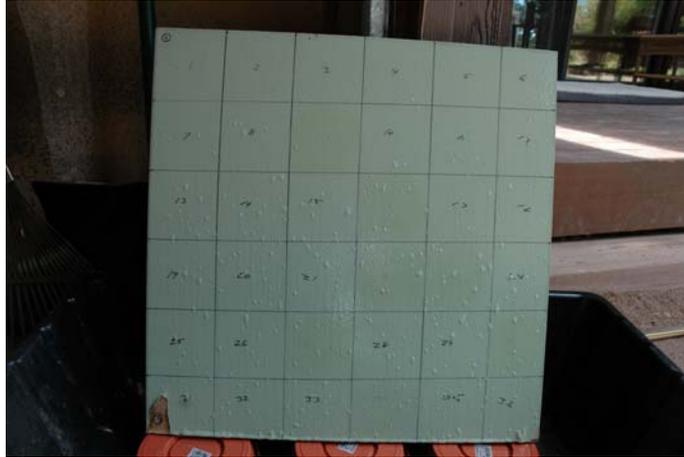


Figure 5. Washing the panel with the oxidizer solutions.

After the treatment, the panels were sampled in the same manner as in the pre-sample portion of the project and the samples sent to DataChem laboratories for analysis.

On January 19, 2009 the third experiment was conducted to determine if an oxidizing agent supplied by EFT Holdings Inc. and developed by Sandia National Laboratories would also be effective in reducing methamphetamine levels on painted drywall. This compound is labeled as EasyDECON and is supplied in three parts by the manufacturer. The three parts include a Penetrator that is a quaternary ammonium product, a Fortifier that is a liquid hydrogen peroxide, and a Booster that is labeled as a diacetin in the MSDS. The three parts are added together immediately prior to spraying them onto the surface. The manufacturer also does not require that the compounds be removed from the surface but does require a 30 minute contact time in which the surface must be wet. The product is a foamy material when applied to the surface.



Figure 6. The EasyDECON kit containing the three-part decontamination material prior to assembly.



Figure 7. The EasyDECON solution application unit after assembly and prior to surface treatment.

This portion of the experiment was conducted in the same manner as the above two oxidizers except that the product was applied with the spray bottle that was provided and then let sit for a period of at least 30 minutes in a wet state. The product was then allowed to dry and the samples were collected in the same manner as in the previous samples. Samples were only taken from the painted drywall material. Seven samples were collected prior to treatment and after treatment, resulting in a total of 14 samples being taken from each of the drywall panels. Each sample consisted of a 100 cm<sup>2</sup> area being sampled from the panel using a 3"x 3" cotton swab to which 3 ml of methanol were added. After sampling the wipe was then put into a plastic centrifuge tube and sent to the laboratory for analysis as in the previous testing.

### **Results:**

A total of 102 samples were collected from the drywall material. For each group of 5 (or 7 in the case of the EasyDecon material) samples, a mean, median and percent reduction was calculated. The results for the quaternary ammonium compound (Formula 409 Cleaner) were as follows:

<i>Treatment</i>	<i>Pre-Mean (ug/100 cm<sup>2</sup>)</i>	<i>Pre-Median (ug/100 cm<sup>2</sup>)</i>	<i>Post Mean (ug/100 cm<sup>2</sup>)</i>	<i>Post Median (ug/100 cm<sup>2</sup>)</i>	<i>Mean % Reduction</i>
<i>No Treatment</i>	20.2	21	21	21	-4 %
<i>One Wash</i>	26	27	2.7	2.7	90%
<i>Three Washes</i>	18	18	1.0	1.0	95%

These results indicate that the washing process using a quaternary ammonia compound was able to initially remove a total of 90% of the methamphetamine contamination in just one wash. The second wash only removed an additional 5% from the drywall surface. The initial removal was higher than the removal observed using Simple Green but it was still not enough to reduce the contamination levels to below most state standards. At the end of three washes, the levels were slightly lower but were still above most current state standards. It appears that the initial wash removed the methamphetamine contamination that was the easiest to remove and subsequent washes were not able to remove much more methamphetamine.

The results obtained from the drywall contamination using the hypochlorite solution (Clorox Clean-Up) were as follows:

<i>Treatment</i>	<i>Pre-Mean (ug/100 cm<sup>2</sup>)</i>	<i>Pre-Median (ug/100 cm<sup>2</sup>)</i>	<i>Post Mean (ug/100 cm<sup>2</sup>)</i>	<i>Post Median (ug/100 cm<sup>2</sup>)</i>	<i>Mean % Reduction</i>
<i>No Treatment</i>	20.2	20	21.4	22	-5.9 %
<i>One Wash</i>	20.4	20	8.9	9.3	57%
<i>Three Washes</i>	23.6	23	8.4	8.3	64%

The decontamination using the sodium hypochlorite solution did not result in as large a reduction in the methamphetamine contamination as did the quaternary ammonium-containing cleaner. The total amount of contamination removed was 64% after the three separate washes. The initial decontamination level was 57% as compared to 90% for the quaternary ammonium compound. The total reduction was only 64% as compared to the 95% reduction after using the quaternary ammonium compound. Again the 3 washes did not remove all of the methamphetamine but after the initial wash, the remaining methamphetamine was not easily removed.

The results obtained from the drywall contamination using the EasyDECON material were as follows:

<i>Treatment</i>	<i>Pre-Mean (ug/100 cm<sup>2</sup>)</i>	<i>Pre-Median (ug/100 cm<sup>2</sup>)</i>	<i>Post Mean (ug/100 cm<sup>2</sup>)</i>	<i>Post Median (ug/100 cm<sup>2</sup>)</i>	<i>Mean % Reduction</i>
<i>No Treatment</i>	15.3	18	14.6	14	4.3
<i>One Wash</i>	14.8	13	<0.05	<0.05	100%
<i>Three Washes</i>	14	14	<0.05	<0.05	100%

The decontamination using the complex of hydrogen peroxide, quaternary ammonium, and diacetin resulted in no methamphetamine being detected after the initial treatment. The subsequent two treatments conducted after the single treatment also resulted in no detectable methamphetamine on the surface of the painted drywall.

### **Discussion and Conclusions:**

The results of the decontamination using the oxidizer cleaners were variable depending upon the cleaner that was utilized. The agent with the best reduction was the hydrogen peroxide/quaternary ammonia complex that resulted in a 100% reduction in the amount of methamphetamine that was recovered. The quaternary ammonia cleaner was the second best compound with a much higher reduction in methamphetamine than the sodium hypochlorite compound. This was true of both the first wash and of the second wash. The quaternary ammonia product appears to perform better than the hypochlorite compound but not as well as the hydrogen peroxide/quaternary ammonia complex compound.

In the case of the EasyDECON compound, the methamphetamine present upon the surface was likely oxidized to another compound. The oxidation was complete and no methamphetamine was detected after the initial treatment. The other compounds did not result in a complete oxidation of the methamphetamine. Although the drywall surfaces were not able to be completely oxidized, the inability of the detergent to remove methamphetamine after the initial amount was removed may suggest that the remaining methamphetamine is not completely available for removal. It is possible that after the initial methamphetamine is removed, that the remaining methamphetamine may not easily leave the surface of the porous materials simply due to touch or simple cleaning. Exposures therefore, may be significantly reduced after the initial cleaning.

There are a number of limitations to this study that must be considered. We utilized only latex paint similar to that used in most houses but not all houses. It is possible that a more impervious paint exists that would not absorb the methamphetamine and make decontamination easier. We also only let the paint cure for a couple of days prior to exposing it in the chamber. Paint that has cured longer may be less permeable to the methamphetamine although Minnesota did not find that to be the case.

In some cases, methamphetamine removal may be even more difficult than we found since we did not apply texturing or any other surface to the wood or drywall prior to

painting. Texture could make decontamination even more difficult since the methamphetamine may penetrate even deeper into the surface of the material.

Although the use of these oxidizing compounds, resulted in a complete or at least significant reduction in the amount of methamphetamine present, there are concerns regarding the use of these compounds. Individuals using these compounds must realize that the compounds can be very toxic when used in a confined space. Pulmonary problems have been reported when products similar to these are used in a confined space. In addition, it is not known what by-products, if any, are left behind after the use of these compounds. Chlorine can combine with organic materials to form compounds that can result in further contamination of the residence. Until the by-products for this type of treatment can be determined, widespread use of these materials should be limited.

### References:

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**Results of Drywall Decontamination with Oxidizing Compounds.**

**Building Material Decontamination with Oxidizer Results**

<b>Sample #</b>	<b>Material Type</b>	<b>Treatment</b>	<b>Meth Conc.</b>	<b>Mean</b>	<b>Median</b>	<b>% reduction Mean</b>
OCN-1	Drywall	Oxidizer Cleaner Blank	17			
OCN-2	Drywall	Oxidizer Cleaner Blank	22			
OCN-3	Drywall	Oxidizer Cleaner Blank	20			
OCN-4	Drywall	Oxidizer Cleaner Blank	21			
OCN-5	Drywall	Oxidizer Cleaner Blank	21	20.2	21	
OCN-6	Drywall	Oxidizer Cleaner Blank	25			
OCN-7	Drywall	Oxidizer Cleaner Blank	17			
OCN-8	Drywall	Oxidizer Cleaner Blank	22			
OCN-9	Drywall	Oxidizer Cleaner Blank	21			
OCN-10	Drywall	Oxidizer Cleaner Blank	20	21	21	-4.0
OC1-1	Drywall	Oxidizer - 1 wash	27			
OC1-2	Drywall	Oxidizer - 1 wash	25			
OC1-3	Drywall	Oxidizer - 1 wash	24			
OC1-4	Drywall	Oxidizer - 1 wash	27			
OC1-5	Drywall	Oxidizer - 1 wash	27	26	27	
OC1-6	Drywall	Oxidizer - 1 wash	3.3			
OC1-7	Drywall	Oxidizer - 1 wash	2.8			
OC1-8	Drywall	Oxidizer - 1 wash	2.2			
OC1-9	Drywall	Oxidizer - 1 wash	2.3			
OC1-10	Drywall	Oxidizer - 1 wash	2.7	2.66	2.7	89.8
OC3-1	Drywall	Oxidizer - 3 washes	19			
OC3-2	Drywall	Oxidizer - 3 washes	16			
OC3-3	Drywall	Oxidizer - 3 washes	18			
OC3-4	Drywall	Oxidizer - 3 washes	15			
OC3-5	Drywall	Oxidizer - 3 washes	22	18	18	
OC3-6	Drywall	Oxidizer - 3 washes	0.96			
OC3-7	Drywall	Oxidizer - 3 washes	1.1			
OC3-8	Drywall	Oxidizer - 3 washes	0.85			
OC3-9	Drywall	Oxidizer - 3 washes	0.99			
OC3-10	Drywall	Oxidizer - 3 washes	0.89	0.958	0.96	94.7
CCN-1	Drywall	Hypochlorite - blank	19			
CCN-2	Drywall	Hypochlorite - blank	22			

CCN-3	Drywall	Hypochlorite - blank	20				
CCN-4	Drywall	Hypochlorite - blank	19				
CCN-5	Drywall	Hypochlorite - blank	21	20.2	20		
CCN-6	Drywall	Hypochlorite - blank	20				
CCN-7	Drywall	Hypochlorite - blank	22				
CCN-8	Drywall	Hypochlorite - blank	23				
CCN-9	Drywall	Hypochlorite - blank	22				
CCN-10	Drywall	Hypochlorite - blank	20	21.4	22		-5.9
CC1-1	Drywall	Hypochlorite - 1 wash	23				
CC1-2	Drywall	Hypochlorite - 1 wash	19				
CC1-3	Drywall	Hypochlorite - 1 wash	18				
CC1-4	Drywall	Hypochlorite - 1 wash	22				
CC1-5	Drywall	Hypochlorite - 1 wash	20	20.4	20		
CC1-6	Drywall	Hypochlorite - 1 wash	9.3				
CC1-7	Drywall	Hypochlorite - 1 wash	9.4				
CC1-8	Drywall	Hypochlorite - 1 wash	8.1				
CC1-9	Drywall	Hypochlorite - 1 wash	7.7				
CC1-10	Drywall	Hypochlorite - 1 wash	9.9	8.88	9.3		56.5
CC3-1	Drywall	Hypochlorite - 3 wash	25				
CC3-2	Drywall	Hypochlorite - 3 wash	26				
CC3-3	Drywall	Hypochlorite - 3 wash	23				
CC3-4	Drywall	Hypochlorite - 3 wash	22				
CC3-5	Drywall	Hypochlorite - 3 wash	22	23.6	23		
CC3-6	Drywall	Hypochlorite - 3 wash	7.6				
CC3-7	Drywall	Hypochlorite - 3 wash	8.3				
CC3-8	Drywall	Hypochlorite - 3 wash	8.6				
CC3-9	Drywall	Hypochlorite - 3 wash	9.6				
CC3-10	Drywall	Hypochlorite - 3 wash	8	8.42	8.3		64.3

### Building Material Decontamination with Sandia Product Results

Sample #	Material Type	Treatment	Meth Conc.	Mean	Median	% reduction Mean	% Reduction Median
SPN-1	Drywall	No Treatment	Pre-Treatment	19			
SPN-2	Drywall	No Treatment	Pre-Treatment	21			
SPN-3	Drywall	No Treatment	Pre-Treatment	11			
SPN-4	Drywall	No Treatment	Pre-Treatment	19			
SPN-5	Drywall	No Treatment	Pre-Treatment	9.4			
SPN-6	Drywall	No Treatment	Pre-Treatment	9.6			

SPN-7	Drywall	No Treatment	Pre-Treatment	18	15.3	18.0		
SPN-8	Drywall	No Treatment	Post Treatment	13				
SPN-9	Drywall	No Treatment	Post Treatment	14				
SPN-10	Drywall	No Treatment	Post Treatment	15				
SPN-11	Drywall	No Treatment	Post Treatment	13				
SPN-12	Drywall	No Treatment	Post Treatment	17				
SPN-13	Drywall	No Treatment	Post Treatment	14				
SPN-14	Drywall	No Treatment	Post Treatment	18	14.6	14.0	4.3	22.2
SP1-1	Drywall	One Wash	Pre-Treatment	12				
SP1-2	Drywall	One Wash	Pre-Treatment	18				
SP1-3	Drywall	One Wash	Pre-Treatment	13				
SP1-4	Drywall	One Wash	Pre-Treatment	13				
SP1-5	Drywall	One Wash	Pre-Treatment	17				
SP1-6	Drywall	One Wash	Pre-Treatment	13				
SP1-7	Drywall	One Wash	Pre-Treatment	15	14.8	13.0		
SP1-8	Drywall	One Wash	Post Treatment	<0.05				
SP1-9	Drywall	One Wash	Post Treatment	<0.05				
SP1-10	Drywall	One Wash	Post Treatment	<0.05				
SP1-11	Drywall	One Wash	Post Treatment	<0.05				
SP1-12	Drywall	One Wash	Post Treatment	<0.05				
SP1-13	Drywall	One Wash	Post Treatment	<0.05				
SP1-14	Drywall	One Wash	Post Treatment	<0.05			100.0	100.0
SP3-1	Drywall	Three Washes	Pre-Treatment	14				
SP3-2	Drywall	Three Washes	Pre-Treatment	13				
SP3-3	Drywall	Three Washes	Pre-Treatment	15				
SP3-4	Drywall	Three Washes	Pre-Treatment	13				
SP3-5	Drywall	Three Washes	Pre-Treatment	13				
SP3-6	Drywall	Three Washes	Pre-Treatment	16				
SP3-7	Drywall	Three Washes	Pre-Treatment	14	14.0	14.0		

SP3-8	Drywall	Three Washes	Post Treatment	<0.05		
SP3-9	Drywall	Three Washes	Post Treatment	<0.05		
SP3-10	Drywall	Three Washes	Post Treatment	<0.05		
SP3-11	Drywall	Three Washes	Post Treatment	<0.05		
SP3-12	Drywall	Three Washes	Post Treatment	<0.05		
SP3-13	Drywall	Three Washes	Post Treatment	<0.05		
SP3-14	Drywall	Three Washes	Post Treatment	<0.05	100.0	100.0