



# ARIZONA DEPARTMENT OF HEALTH SERVICES

## PREPAREDNESS

October 4, 2016

Dear Ms. [redacted]:

Thank you for contacting the Arizona Department of Health Services (ADHS). I have reviewed the reports you submitted that were conducted by EMLab P&K and Prism Analytical Technologies.

### ***Formaldehyde***

#### Available Environmental Data

Air quality tests were conducted by [redacted] using IAQ Home Survey™, and indicated a formaldehyde concentration of 31 parts per billion (ppb) in your home. IAQ Home Survey™ uses a 20 minute sample to determine the formaldehyde concentration with the Hantzsch method, which is in accordance with the National Institute of Occupational Safety and Health (NIOSH) 2016 guidelines. ADHS will conduct an assessment on short-term exposure based on this formaldehyde concentration – however, we cannot make an assessment on long-term exposure or cancer risk since the formaldehyde concentration in your home may fluctuate throughout the day. We generally recommend collecting a 24-hour air sample using an EPA approved method, as this would better characterize residential exposure.

#### Exposure Pathway Analysis

Identifying exposure pathways is important in a health consultation because adverse health impacts can only happen if people are exposed to contaminants. The presence of a contaminant in the environment does not necessarily mean that people are actually coming into contact with that contaminant. Exposure pathways have been divided into three categories: completed, potential, and eliminated.

There are five elements considered in the evaluation of exposure pathways:

- 1) a source of contamination
- 2) a medium such as soil or groundwater through which the contaminant is transported
- 3) a point of exposure where people can contact the contaminant
- 4) a route of exposure by which the contaminant enters or contacts the body
- 5) a receptor population

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Completed pathways exist when all five elements are present and indicate that exposure to a contaminant has occurred in the past and/or is occurring presently. In a potential exposure pathway, one or more elements of the pathway cannot be identified, but it is possible that the element might be present or might have been present. In eliminated pathways, at least one of the five elements is or was missing, and will never be present. Completed and potential pathways, however, may be eliminated when they are unlikely to be significant.

For this case, the exposure pathway of concern is through inhalation of the air in your home.

Exposure Pathway Elements					Time Frame	Type of Exposure Pathway
Source	Media	Point of Exposure	Route of Exposure	Estimated Exposed Population		
Flooring, Indoor Products	Air	Home	Inhalation	Residents	Past	Completed
					Current	Completed
					Future	Potential

Description of Health-based Comparison Values

Health-based comparison values (CVs) are screening tools used to evaluate environmental data relevant to exposure pathways. The comparison values are quite conservative, and usually include uncertainty factors that account for the most sensitive populations. Adverse health effects are not expected to occur if an exposure concentration/dose is below a CV. However, an exposure concentration/dose at or above the CV does not mean adverse effects will occur. Rather, it means that there is a need to conduct a site-specific exposure scenario evaluation. The health risk for an individual depends on individual human factors (e.g. personal habits, occupation, and/or overall health), and site-specific environmental exposure factors (e.g. duration and amount of exposure). Therefore, CVs should not be used to predict the occurrence of adverse health effects without looking at site-specific conditions. CVs are only used to help determine if the contaminant needs to be evaluated in more detail.

The analytical results were compared to the following CV: Acute (1-14 days) Environmental Media Evaluation Guide (Acute EMEG). EMEGs are estimated contaminant concentrations that are not expected to result in adverse noncarcinogenic health effects based on the Agency for Toxic Substances and Disease Registry (ATSDR)'s evaluation.

Chemical	Detected frequency	Detected Concentration (ppb)	Comparison Value (ppb)	Source of CV	Is it a Contaminant of Concern?
Formaldehyde	1/1	31	49	Acute EMEG	No

Formaldehyde was detected at a lower concentration than its acute EMEG, therefore no further evaluation is required for an acute exposure.

### Toxicological Information

Formaldehyde is a colorless, flammable gas that has a distinct, pungent smell. Small amounts of formaldehyde are naturally produced by plants, animals, and humans. It is used in the production of fertilizer, paper, plywood, and urea-formaldehyde resins. It is also used a preservative in some foods, and in household products such as antiseptics, medicines, and cosmetics. Exposure to formaldehyde primarily occurs through breathing air containing releases of formaldehyde from industries, wood products, automobile exhaust, cigarette smoke, paints and varnishes, carpets, and permanent press fabrics.

Nasal and eye irritation, neurological effects, and increased risk of asthma and/or allergy have been observed in humans breathing 100 to 500 ppb. Eczema and changes in lung function have been observed at 600 to 1900 ppb.

The Department of Health and Human Services (HHS) determined that formaldehyde is a known human carcinogen based on sufficient human and animal inhalation studies. The International Agency for Research on Cancer (IARC) has classified formaldehyde as a Class 1 carcinogen, meaning there is sufficient human evidence to show that it is carcinogenic to humans.

### Child Health Considerations

ADHS considers children in its evaluations of all exposures, and uses health guidelines that are protective of children. In general, ADHS assumes that children are more susceptible to chemical exposures than adults. Children may be more sensitive to the effects of pollutants than adults. If toxic exposure levels are high enough during critical growth stages, the developing body systems of children can sustain permanent damage. The comparison value (CV) used in this assessment was developed to be protective of susceptible populations such as children.

### Conclusion & Recommendations

ADHS does not expect any acute adverse health effects based on the formaldehyde concentration determined by the 20 minute sample. ADHS was not able to determine the long term health effects (both cancer and non-cancer). We recommend the collection of a 24-hr sample using an EPA approved method in order to analyze longer term exposure and potential cancer risk.

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Opening windows and using fans to bring fresh air indoors are the easiest ways to lower formaldehyde levels in your house. Refraining from smoking or using unvented heaters indoors can lower levels. Removing formaldehyde sources in your home (in this case, by replacing the flooring) can also reduce exposure. For more information on formaldehyde, please see the following information sheet compiled by the American Industrial Hygiene Association (AIHA): [https://www.aiha.org/publications-and-resources/Documents/AIHA\\_FormaldahydeFactSheet.08.14.15V2.pdf](https://www.aiha.org/publications-and-resources/Documents/AIHA_FormaldahydeFactSheet.08.14.15V2.pdf).

### ***Volatile Organic Compounds (VOCs)***

The test results indicated a total volatile organic compounds (TVOC) concentration of 970 ng/L in your home. VOCs refers to any organic chemicals that are present as gases at room temperature, such as benzene and formaldehyde. Many of them are used as ingredients in household products such as paints, wood preservatives, aerosol sprays, and cleansers and disinfectants. They all could be potential sources of VOCs in the home. Breathing in low levels of VOCs for extended periods of time may increase some people's risk for health problems. Several studies suggest that exposure to VOCs may exacerbate symptoms for people with asthma or who are particularly sensitive to chemicals.

Most guidelines are set for single chemicals because the toxicity varies for each individual chemical. Less is known about the health effects from exposure to a group of VOCs. There are no federal or state standards for total VOC levels in non-industrial settings. To protect your health, it is best to limit exposure to products and materials that contain VOCs. Steps to reducing VOC exposure include increasing ventilation, lowering room temperature, and removing the source of VOC in the home. For more information on VOCs, please see the following information sheet compiled by the Environmental Protection Agency (EPA): <https://www.epa.gov/indoor-air-quality-iaq/volatile-organic-compounds-impact-indoor-air-quality#Levels>.

### ***Mold***

Different tests were conducted to identify potential mold issues at the residence. Mold spores were identified from a swab sample collected from the bathroom. The spore trap sampling results indicated that mold spores are present at concentrations of 22 colony forming units per cubic meter (CFU/m<sup>3</sup>) for the indoor sample. As a comparison, an outdoor sample was collected and the spore concentration was measured as 67 CFU/m<sup>3</sup>. Another test determined a total mold volatile organic compounds (TMVOC) level of 3 nanograms per liter (ng/L), which is a lower TMVOC level than is found in most homes and working environments. However, the

assumption that mold infestations might be detected by microbial VOC emissions must be considered with great reservation<sup>1</sup>.

Based on the report, we cannot determine the extent of mold growth in your home. Mold spores can be released into the air and easily be inhaled. Spores may contain allergens that can cause irritation to the nose, throat, and respiratory tract.

Currently, there are no federal standards or recommendations for judging what is an acceptable, tolerable, or normal amount of mold. Scientific research on the relationship between mold exposures and health effects is ongoing. Some organizations have set more specific cut-offs for mold in the environment<sup>2</sup>. Although no elevated indoor mold spore level was identified, if mold presence is identified, regardless of the type or concentration of mold, removal is recommended.

Some people are more sensitive to mold exposure than others. The following individuals may be at higher risk for adverse health effects resulting from exposure to mold: infants and children, the elderly, immune compromised patients, pregnant women, and individuals with existing respiratory conditions. Exposure to molds can cause symptoms such as nasal stuffiness, eye irritation, wheezing or skin irritation. Some people, such as those with serious allergies to molds, may have more severe reactions such as fever and shortness of breath. If you are experiencing potential health effects due to mold exposure, please consult with your family or general health care provider.

Please let me know if you have any other questions.

Sincerely,

Kaleb Tsang, MSEnvE  
Public Health Risk Assessor

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<sup>1</sup> Schleibinger et al. Microbial volatile organic compounds in the air of moldy and mold-free indoor environments. *Indoor Air*, 18(2): 113-24, 2008.

<sup>2</sup> Reboux et al. (2009) provides the following thresholds for indoor mold concentrations: below 170 colony forming units (CFU)/m<sup>3</sup>, between 170 and 560 CFU/m<sup>3</sup>, 560 and 1000 CFU/m<sup>3</sup>, and above 1000 CFU/m<sup>3</sup>, respectively for dwellings with low, moderate, high, and very high concentrations. The latter would be considered a potential health hazard.

Reboux G, et al. Indoor mold concentration in Eastern France. *Indoor Air*, 19: 446-453, 2009.

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