PRISM Analytical Technologies

Sample Report

IAQ Home Survey™

Formaldehyde

Home Air Analysis For: Recent renovation.
Home Tested: 123 W. Maple Ave.
Boston, MA 25478

Sampling Professional: Alex Carter
Air Quality Inspections
3212 NW 12th St.
Baltimore, MD 21224
U.S.A.

Client Sample ID: Kitchen
Sample Volume (L): 5.0
Date Sampled: 02/03/2015
Sample Type: TDT 112J

Report Number: 6010
Laboratory ID: 6010-2

Thank you for using IAQ Home Survey!
If you have questions about your report, please contact your service provider who performed this test.

Order Date: 02/04/2015
Scan Date: 02/05/2015
Report Date: 02/06/2015

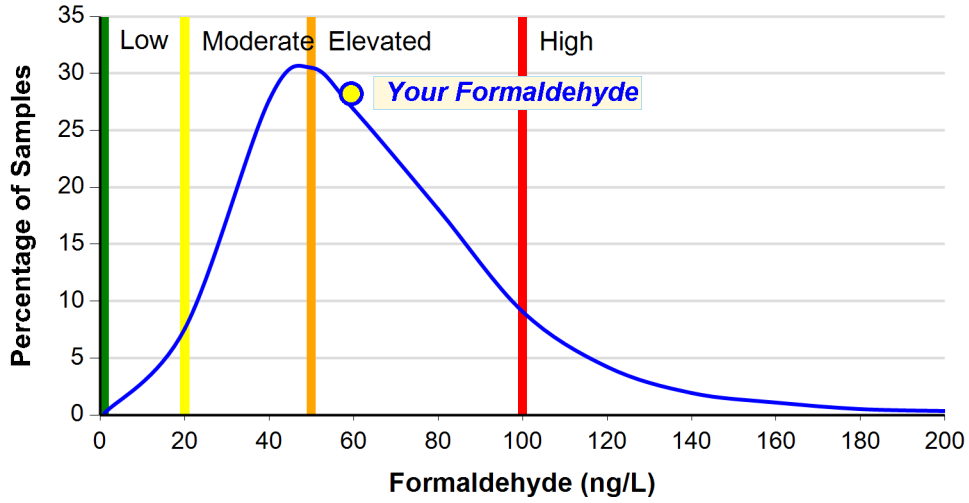
Formaldehyde Concentration: 60 ng/L (48 ppb)

Your Formaldehyde Level (Highlighted)

Low	Moderate	Elevated	High
< 20 ng/L < 16 ppb	20-50 ng/L 16-40 ppb	50-100 ng/L 40-80 ppb	> 100 ng/L > 80 ppb

Recommendation: Consider locating and removing formaldehyde sources. See formaldehyde sources section for more information.

All IAQ Survey Formaldehyde Results



This chart represents the Formaldehyde distribution of over 7,000 samples.

Approximately half the samples have concentrations in the 30-70 ng/L range.

The chart above shows the formaldehyde concentrations for all homes tested using IAQ Home Survey. Results for this air sample are displayed on the chart as a yellow circle. The blue curved line represents the relationship between the percentage of homes (indicated on the vertical y-axis) and the formaldehyde concentration (indicated on the horizontal x-axis). The green, yellow, orange, and red vertical bars represent divisions between Low, Moderate, Elevated, and High formaldehyde concentrations.

Formaldehyde concentrations can vary depending on environmental conditions such as temperature, humidity, and ventilation rate. As temperature and humidity increase, the formaldehyde concentration will increase and as the ventilation rate increases, the formaldehyde concentration will decrease.

Formaldehyde Exposure Guidelines for Homes

Although there are no requirements set for formaldehyde concentration limits in homes, there are a number of recommendations that may be useful. Many organizations or government authorities suggest formaldehyde concentrations not exceed **100-120 ng/L (80-100 parts per billion or ppb)** and **50-60 ng/L (40-50 ppb)** for short term and longer term exposures, respectively. Some organizations or government authorities recommend more stringent levels for longer term exposures. In general, formaldehyde concentrations should be kept as low as reasonably achievable. Most homes measured by Prism's air test have concentrations in the range of 30 to 70 ng/L.

For an occupational exposure reference, the National Institute for Occupational Safety and Health (NIOSH) has set a recommended exposure limit (REL) of 20 ng/L (16 ppb). The Occupational Safety and Health Administration (OSHA) has set a workplace permissible exposure limit (PEL) of 940 ng/L (750 parts per billion).

The table below provides some information on the variety of recommendations for home environments.

Organization	Concentration		Year	Comments
	ng/L	ppb	Issued	
WHO	100	80	1987	0.5 hour
LEED*	32	27		4 hour
California	94 33 3	76 27 2	1999 2004 2005	1 hour (acute) 8 hour (interim) Annual average (chronic)
Canada	120 50	100 40	2005 2005	1 hour 8 hour
UK	100	80	2004	0.5 hour
Germany	120	100	1977	
France	50 10	40 8	2008	2 hour (proposed) Long-term (proposed)
Norway	100 60	80 50	1999 1990	0.5 hour 24 hour
Australia	100	80	2009	
China	100	80	2003	1 hour
Japan	100	80	1997	0.5 hour
Hong Kong	100 30	81 25	2003	Good Excellent

Sources:
Salthammer et al., Chem Rev., 2010, 110, 2536-2572 (for all except as listed below)
* Green Building Council Leadership in Energy & Environmental Design (LEED)

Note: Concentration can be expressed in several ways and various organizations may use different units.
1 ng/L = 1 μg/m³ = 0.001 mg/m³
1 ppb = 0.001 ppm
To convert between the two sets of units listed above the molecular weight of formaldehyde must be used, which produces the conversion factors below:
ppb concentration = ng/L concentration * 0.8 or ng/L concentration= ppb concentration * 1.25

Major Health Effects of Formaldehyde Exposure

Health effects vary depending on the individual. Common symptoms of acute exposure include irritation of the throat, nose, eyes, and skin; this irritation can potentially exacerbate asthma symptoms and other respiratory illnesses. Long term, or chronic, exposure may also cause chronic runny nose, chronic bronchitis, and obstructive lung disease. In 2004, the International Agency for Research on Cancer (IARC) reclassified formaldehyde from "probably carcinogenic to humans" to "carcinogenic to humans" related to nasopharyngeal cancer. Since many factors are involved in the development of cancer, no definitive "safe level" of exposure has been established. The best way to reduce the risk of cancer is to limit exposure.

Formaldehyde Sources

There are many possible sources for formaldehyde in a home, although building products typically make up a large proportion of the concentration. Any recent renovation or new materials brought into the home is likely to increase the formaldehyde levels. The concentration will decrease over time as the materials off gas, so increasing the ventilation as much as possible is typically the best way to quickly decrease the formaldehyde in your home after recent renovation or installation of new materials.

- Products that contain urea-formaldehyde (UF) resins
  - particleboard, hardwood plywood paneling, medium density fiberboard
- Products that contain phenol-formaldehyde (PF) resins (lower concentrations of formaldehyde than UF resins)
  - softwood plywood, flake or oriented strand board
- Pre-finished engineered flooring
- Insulation
- Glues and adhesives
- Paints and coatings
- Textiles
- Disinfectant cleaning products and soaps
- Preservatives
- Personal care products, especially certain hair products
- Cosmetics
- Pet care products
- Bactericides and fungicides
- Combustion byproduct (burning)
  - Tobacco smoke and fuel-burning appliances (gas stoves, kerosene space heaters and fireplaces)

Formaldehyde is also produced naturally in living systems, e.g., trees and other plant life, and during decay and combustion processes. Formaldehyde is also involved in atmospheric processes. Outdoor concentrations of formaldehyde from both natural and man-made sources can range from less than 1 ng/L in remote areas to 10-20 ng/L in urban environments.

Additional Resources

World Health Organization (WHO) Air Quality Guidelines for Europe, 2nd Edition (2000); pg 87-91
Europe: Report No. 7-Indoor Air Pollution by Formaldehyde in European Countries (1990)
Health Canada: Residential Indoor Air Quality Guideline-Formaldehyde
US Consumer Product Safety Commission (CPSC) Update on Formaldehyde (2013)
Environmental Health (US) - Formaldehyde Exposure in Homes: A Reference Guide for State Officials to use in Decision Making
US Environmental Protection Agency: Formaldehyde
US Agency for Toxic Substances and Disease Registry (ATSDR): Formaldehyde ToxFAQs™
US National Institutes of Health (NIH): ToxTown: Formaldehyde
Chemical Reviews (Journal): Formaldehyde in the Indoor Environment
Household Products Database: Formaldehyde

These results are authorized by the Laboratory Director or approved representative.