



Utilizing GrayWolf Meters to Measure for Asthma Triggers

Asthma is a chronic lung disease affecting 18.7 million adults¹ and 6.8 million children in America². These numbers are not declining; from 2001 to 2009 there were 4.3 million more people diagnosed with asthma.³ In 2007, the CDC reported a \$56 billion cost to the US economy in asthma-related medical expenses, absences from work and school.



There are a number of different factors that trigger asthma, many of which are encountered daily. The EPA states that secondhand smoke, dust mites, mold, cockroaches and pests, pets, nitrogen dioxide (NO₂), chemical irritants, outdoor air pollution, and wood smoke can all trigger asthma⁴. Ammonia (NH₃), commonly found in cleaning products, may impact populations that have high exposures at work⁵ (e.g. on farms). While it is unknown why the number of people affected by asthma is growing, reducing the exposure to asthma triggers can help reduce the number of asthma attacks.

Factors such as secondhand smoke, dust mites, pet dander, mold and wood smoke can all be estimated, based on their particulate size. A comprehensive breakdown of common particulates can be seen in the accompanying chart. All of these triggers can be reduced, either by avoiding direct exposure, utilizing air filters or particle cleaning systems.

	<0.1	0.1-0.3	0.3-0.5	0.5-1.0	1.0-2.5	2.5-5.0	5.0-10.0	10.0-25.0	>25.0
Viruses	Red								
Bacteria		Green							
House Dust Mite Allergens		Yellow							
Pet Dander						Blue			
Mold						Orange			
Soot		Yellow							
Smog		Blue						Red	
Mold Spores								Red	
Tobacco Smoke		Orange							Green
Pollen								Green	
Cooking Smoke		Red							
Oil Smoke			Green						
Wood Smoke			Yellow						
Auto Emissions		Blue							
Suspended Atmospheric Dust		Orange							
Settling Dust					Red				
Lung Damaging Dust					Green				
Asbestos					Yellow				
Lint								Blue	

Triggers such as nitrogen dioxide (NO₂), and carbon monoxide (CO) can come from combustion generated by unvented kerosene and gas space heaters, boilers and furnaces, and exhaust from gasoline-powered equipment. Both compounds are odorless, which makes tools to detect them even more vital.

Outdoor air pollution can be contaminated with ozone (O₃) generated from motor vehicle exhaust, or from other sources. It may also be produced by office equipment. Ozone has a very pungent odor, but quantifying the value present is essential.

Chemical irritants are caused by products such as paints and cleaners which contain many different volatile organic compounds (VOCs). If the specific contaminant is unknown, a total volatile organic compound (TVOC) concentration will help inform of any elevated levels present, to potentially bloodhound the source, and determine if additional testing is indicated.

Specific VOCs such as formaldehyde (HCHO) may be of extra interest, and at very low concentrations. Formaldehyde can be found in bonding agents or adhesives commonly found in carpets, furniture, plywood, and particle board. Formaldehyde is of great concern, and has led the California Environmental

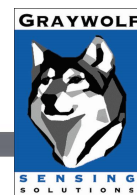
¹CDC Summary Health Statistics for U.S. Adults: National Health Interview Survey, 2012, Table 3,4

² CDC Summary Health Statistics for U.S. Children: National Health Interview Survey, 2012, Table 1

³ CDC <http://www.cdc.gov/vitalsigns/pdf/2011-05-vitalsigns.pdf>

⁴ www.epa.gov/asthma/triggers.html

⁵ <http://health.usnews.com/health-conditions/allergy-asthma-respiratory/asthma/overview>



Protection Agency (CA EPA) to identify a link between formaldehyde with increases in asthma-like symptoms.⁶



GrayWolf offers a comprehensive solution for measuring parameters associated with asthma triggers. The chart below shows some of the available sensors:

Parameter	Example Sources
TVOCs	Cleaners, paints and lacquers, adhesives, carpeting, pesticides, cosmetics, personal care products, air fresheners, fuel products, secondhand tobacco smoke
Formaldehyde	Pressed wood products, insulation, hair products, secondhand smoke
Particulate	Secondhand smoke, dust mites, pet dander, wood smoke, inadequately filtered outdoor air pollution
Nitrogen Dioxide	Outdoor air, improperly vented combustion
Ozone	Outdoor air, copiers/printers
Carbon Monoxide	Improperly vented combustion, secondhand smoke, wood smoke
Ammonia	Cleaning products, pet/animal waste

The GrayWolf FM-801 formaldehyde meter also has a very low limit of detection (<10ppb HCHO), utilizing a unique, long-term trending colorimetric/photometric technique. The additional toxic gases; nitrogen dioxide, ozone, carbon monoxide, and ammonia are all measured with fast response, accurate electrochemical sensors that exhibit minimal drift. GrayWolf's 6-channel particle counters, the PC-3016 and PC-4000, are able to measure particles as small as 0.3 microns. These units will not be able to identify whether it is smoke, dust, dander, etc., but display 6 different size ranges simultaneously and will assist in determining whether additional tests are necessary.

All of these parameters can be measured individually or integrated into a single, powerful monitoring system to quantify common asthma triggers.

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GrayWolf's TVOC meters, which utilize a photo ionization detector (PID), have excellent sensitivity (<5ppb) and a resolution of 1ppb allowing detection of very minimal amounts of TVOCs. PID's will not identify the individual compounds present, but will indicate if more detailed analysis is appropriate.

⁶ California Environmental Protection Agency. *Appendix D. Individual Acute, 8-hour and Chronic Reference Exposure Level Summaries, December 2008. Appendix D1, Formaldehyde Reference Exposure Levels, pp 128-169. 2008*

