



TOX TOPIC*

*Documents like this created after 2014 are dubbed Express Statements.

Can All Those Chemicals Be Causing My Asthma?

Reviewed by the SOT Inhalation and Respiratory Specialty Section leadership in May 2015

Asthma is a lung disorder characterized by symptoms of wheezing, shortness of breath, chest tightness and cough. In children in particular, asthma symptoms can appear as a recurring nighttime cough. Left untreated, individuals with asthma can experience great difficulties in breathing, reduced quality of life, and repeated visits to the emergency department because they can't get enough air. The incidence of asthma is rising in the United States, affecting 7.3% of adults and 9.1% of children. Thus asthma affects an estimated 20 million people, including 6.7 million children. Asthma accounts for more than 14 million outpatient clinic visits and nearly 2 million emergency room visits each year.

Asthma is a disorder of the lungs with widespread narrowing of airways due to contraction of the airway muscle, fluid accumulation in the tissue, and mucus in the air passages (bronchi and bronchioles). Numerous white blood cells, particularly eosinophils, invade the lung causing inflammation. In addition, the airways become 'twitchy.' That is, exposures that do not cause airway narrowing in a non-asthmatic will cause severe narrowing of the airways in an asthmatic. All of these events in the lung result in the wheezing, shortness of breath and chest tightness.

We don't know what causes the development of asthma. We do know that asthma has a genetic component so that if your family members have asthma, you are more likely to develop asthma. We also know many of the events that will trigger asthma symptoms. If you have allergies, then exposure to common environmental allergens such as pollen, cockroaches, dust mites, molds, pets and animals (especially birds) can trigger your asthma symptoms. Even without allergies, exposure to irritants such as cigarette smoke and pollution, cold air, exercise, stress and development of viral infections can trigger asthma symptoms.

Chemical exposures can also trigger asthma. This can happen in two different ways. In one instance, you can actually develop an allergy to a chemical when your immune system recognizes it specifically as a foreign substance. For example, workers in the polyurethane

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foam industry or automobile spray painters can develop allergies to chemicals called isocyanates. Continued exposure to these chemicals cause severe and debilitating asthma symptoms. Even if you don't develop allergies, exposure to high concentrations of irritating and reactive chemicals in industrial settings can also be a trigger for asthma. Even in lower concentrations, many chemicals are irritants and will trigger symptoms in asthmatics that have twitchy hyperresponsive airways. In any case, the treatment of the asthma symptoms is the same, using inhaled drugs that open the airways and reduce the inflammation in the lung.

There is general agreement that exposure to home cleaning chemicals in industrial and household cleaning products is linked with asthma: ammonium quaternary compounds, disinfectants, bleach, air fresheners, furniture polish, etc. However, there are differing opinions as to whether inhaling the household chemicals is an asthma trigger, and/or whether the household cleaning results in less exposure to microbial products and an alteration in the balance of the immune system resulting in asthma. The hygiene hypothesis of asthma suggests that reduced exposure to infections and microbes at a young age (too clean) in developed countries shifts the immune system balance to favor development of allergies and asthma. Thus, whether asthma control should be directed at reducing exposure to multiple asthma triggers or shifting the balance of the immune system is unresolved.

Current research in asthma is aimed at defining the cause(s) of asthma and determining if certain asthma therapies are more effective in controlling different sub-categories of asthma, such as childhood vs. adult, mild vs. severe, allergic vs. non-allergic asthma. Research on asthma includes epidemiological studies in humans as well as use of animal models that can help reveal mechanisms that control lung function and ways to avoid allergy and immune system imbalance. In toxicology, a primary focus of asthma research is identifying chemicals that have the potential of causing asthma in occupations that produce the chemical or in consumers who use the chemical product. Developing screening methods and setting limits of exposure to these chemicals is a continuing challenge to protect both workers and consumers from developing asthma.

In order to prevent asthma attacks, avoidance of triggers is important. Thus, remove sources of mold and dander from the house, reduce humidity and dust, keep windows closed, use a room air cleaner, remove carpets, ban smoking and burning wood inside the house, avoid forced hot-air heating systems, install hot-water radiant-heat systems, and use fragrance-free products. Outside the house, it is helpful to keep grass trimmed to less than

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one inch, and shrubs and trees trimmed to reduce mold-producing shade. When using household chemicals, minimize their use, avoid direct inhalation of sprays, and insure adequate ventilation.

Additional Sources of Information:

- Center for Disease Control: <http://www.cdc.gov/asthma/faqs.htm>
- National Heart Lung and Blood Institute: <http://www.nhlbi.nih.gov/health/public/lung/index.htm#asthma>
- U.S. Environmental Protection Agency: <http://www.epa.gov/asthma/index.html>
- American Lung Association: <http://www.lung.org/lung-disease/asthma/>

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