Asthma and Chemicals: A Focus on Cleaning, Disinfection, and Sterilization

The Toxics Use Reduction Institute (TURI) works to help Massachusetts businesses and communities reduce their use of toxic chemicals. This fact sheet provides a brief summary of the links between chemicals and asthma, and options for using safer alternatives.

WHAT IS ASTHMA AND HOW DOES IT DEVELOP?

Asthma is a chronic disease that causes the airways of the lungs to narrow, swell, and produce extra mucus in response to stimuli. Asthma symptoms include recurrent periods of wheezing, coughing, chest pain or tightness, and difficulty breathing. Asthma typically develops through a complex process involving multiple factors. Chemical exposures can be one of these factors. [1]

Asthmagens are substances that can cause the development of asthma (i.e., the initial onset of the disease). According to the Association of Environmental and Occupational Clinics, as well as reviews of the scientific literature, dozens of chemicals are known to be asthmagens.[2] Chemical asthmagens include latex rubber and substances within the chemical categories of diisocyanates, acrylates, aldehydes, anhydrides, and metal compounds, among others. A number of these chemicals may be found in common household products, including household cleaning products. Personal care products, furnishings and building materials can also contain asthmagens.[1]

There are two common classifications for how asthma develops: **allergic asthma** and **non-allergic (irritant) asthma.** Allergic asthma results from exposure to **respiratory sensitizers.** Non-allergic asthma is caused by exposure to **irritants**. One subset of non-allergic asthma is **Reactive Airways Dysfunction Syndrome (RADS)**. It is not always known by which mechanism chemicals can cause asthma in a given individual.

Chemical asthmagens can also **exacerbate** existing asthma, producing "asthma attacks." Other substances and conditions can trigger asthma attacks, including animal and plant allergens, dust mites, exercise, cold air, and air pollution, among others. For more details on asthma and chemicals, see TURI's detailed fact sheet on asthma-related chemicals.[3]

ASTHMAGENS IN CLEANING, DISINFECTION, AND STERILIZATION PRODUCTS

The 2020 Covid-19 pandemic has led to increased use of cleaning, disinfecting, and sterilization chemicals.[4] Some of these chemicals can cause asthma in people with no prior history of the disease. Some can also trigger asthma attacks in individuals who already have asthma. Common examples of these chemicals are outlined in Table 1. Cleaning and janitorial professionals are particularly at risk of exposure. However, options are available to clean and disinfect successfully while also minimizing exposure to asthma-causing chemicals.

Look for the following safer chemistry labels on products: Green Seal®, Ecologo®, Safer Choice, and Design for the Environment.

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Table 1. Examples of asthmagens in cleaning, disinfecting, and sterilization products	
SENSITIZERS	
Aldehyde Compounds	- Disinfectants, preservatives - Examples: glutaraldehyde, formaldehyde
Amine Compounds	- Emulsifiers, stabilizers - Example: monoethanolamine
Ethylene Oxide	- Sterilant (primarily for medical devices)
Isothiazolinones	- Preservatives
Quaternary Ammonium Compounds	- Disinfectants - Examples: benzalkonium chloride, alkyl dimethyl benzyl ammonium chlorides and others
Scents Containing Terpenes	- Fragrance - Examples: pinene, d-limonene
IRRITANTS	
Ammonia	- Cleaning
Bleach (sodium hypochlorite)	- Disinfectant - Note: NEVER MIX bleach with ammonia, acids, or other products. These mixtures can create highly toxic chlorine gas.
Hydrochloric Acid	- Cleaning

Sources: Chemical list drawn from Quirce, S; Barranco, P. Cleaning Agents and Asthma. *Journal of Investigational Allergology and Clinical Immunology* 2010; Vol. 20(7): 542-550. AOEC database.

SAFER CLEANING AND DISINFECTION

There are many cleaning and disinfecting products on the market that are free of known or suspected asthmagens. The EPA's Safer Choice Program (formerly named Design for the Environment) identified a number of safer disinfecting chemicals, including **hydrogen peroxide*, alcohol** (isopropyl alcohol or ethanol), **citric acid**, and **lactic acid**, among others.

The Environmental Working Group issued a list of household cleaning/disinfecting products that contain safer active ingredients. TURI has also created guidance for safer cleaning and disinfection, including Covid-19: Safely clean and disinfect for households.[5]

It is also important to avoid overuse of disinfectants. Always clean before disinfecting, in order to minimize use of disinfectant and maximize effectiveness.

ADDITIONAL RESOURCES IN MASSACHUSETTS

Technical assistance on safer cleaning: TURI Cleaning Laboratory www.turi.org/lab.

Work-related asthma: Massachusetts Department of Public Health, Occupational Health Surveillance Program www.mass.gov/dph/ohsp.

General asthma prevention and control: Massachusetts Department of Public Health, Asthma Prevention and Control Program www.mass.gov/dph/asthma.

Safe working practices: Massachusetts Department of Labor Standards, Onsite Consultation Program, www.mass.gov/on-site-consultation-program

REFERENCES

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2. The Association of Occupational and Environmental Clinics (AOEC). Exposure code Lookup (database). www.aoecdata.org/ExpCodeLookup.aspx. Accessed May 22, 2020.

3. Toxics Use Reduction Institute (TURI). Massachusetts TURI TUR and Disease Prevention Fact Sheet: Asthma. 2012. www.turi.org/TURI_Publications/TURI_Chemical_Fact_Sheets/Asthma-related_Chemicals.

4. Chemical Watch. Covid-19: concern over link between disinfectant use and respiratory health. members.chemicalwatch.com/article?id=110181. Published April 23, 2020. Accessed May 22, 2020.

5. TURI. Covid-19: Safely clean and disinfect for households. Published May 2020. Accessed May 28, 2020. www.turi.org/Our_Work/Cleaning_Laboratory/COVID-19_Safely_Clean_Disinfect

* Note: the combination of hydrogen peroxide and peroxyacetic acid (peracetic acid) is an asthmagen. Avoid products that contain the combination of these ingredients.