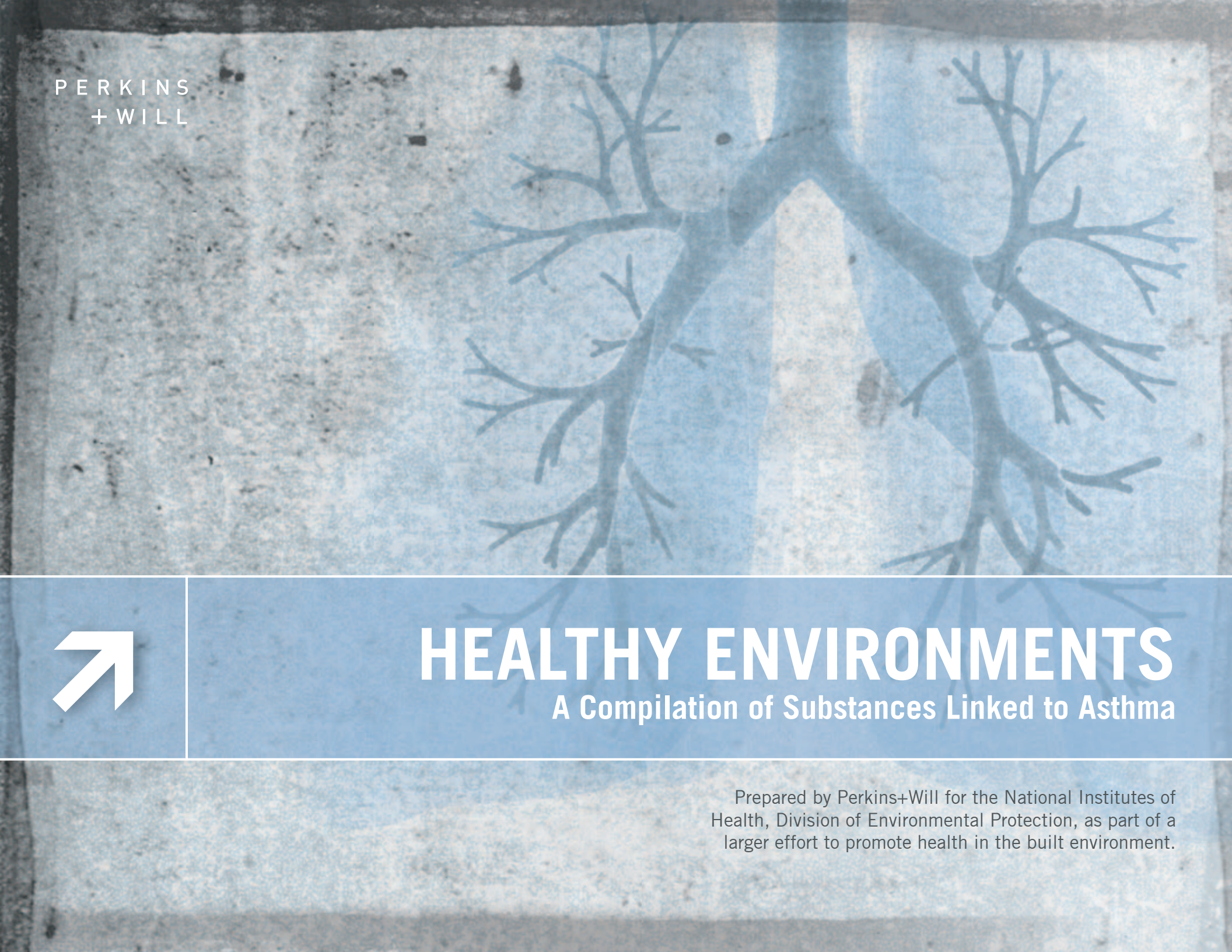


PERKINS
+WILL

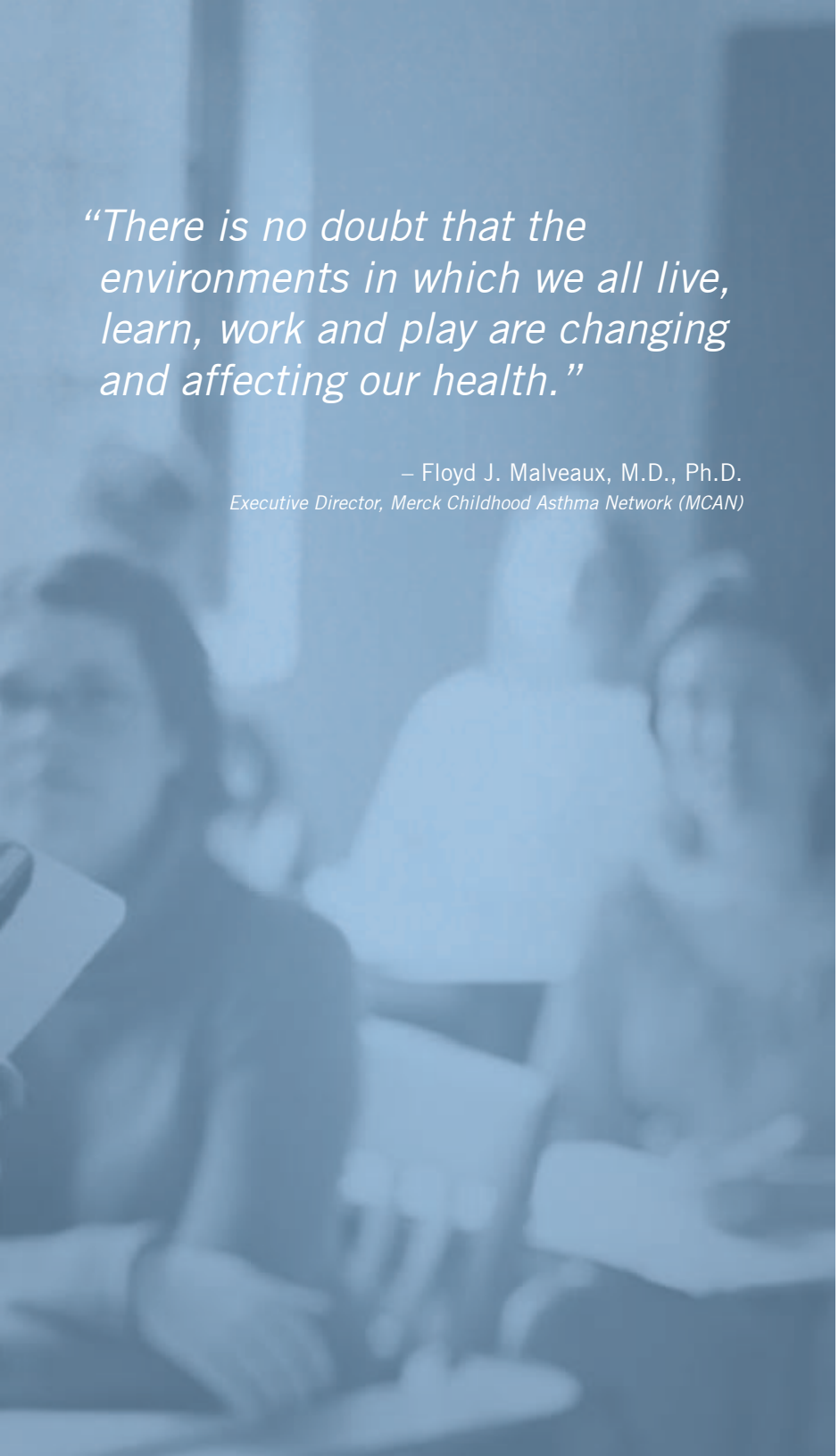
# HEALTHY ENVIRONMENTS

## A Compilation of Substances Linked to Asthma

Prepared by Perkins+Will for the National Institutes of Health, Division of Environmental Protection, as part of a larger effort to promote health in the built environment.

## PURPOSE STATEMENT

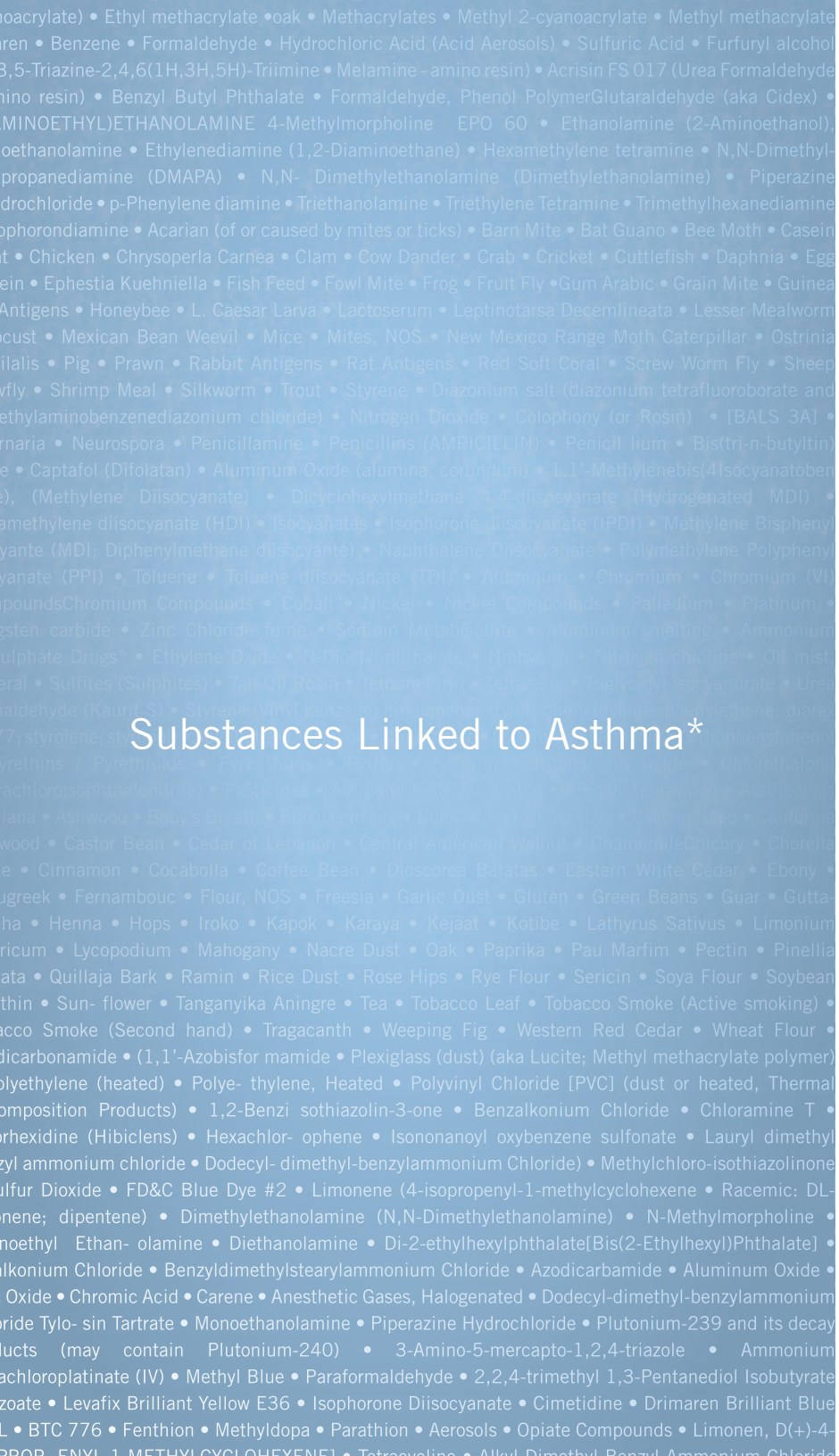
This report was prepared by Perkins+Will on behalf of the National Institutes of Health, Office of Research Facilities, Division of Environmental Protection, as part of a larger effort to promote health in the built environment. Our research team noted that based on extensive experience, there is a need for more research on the impact that materials and conditions in the built environment have on occupant health. Additionally, existing research data has not been compiled and made available in a form that is readily usable by building professionals for integrating health protective features in the  design and construction of buildings. Toward meeting these needs our research team set out to compile data on substances in the built environment that may cause or aggravate asthma, a disease of high and increasing prevalence and major economic importance. This list should be a valuable resource for identifying asthma triggers and asthmagens, minimizing their use in building materials and furnishings, and contributing to our larger goals of fostering healthier built environments.



*"There is no doubt that the environments in which we all live, learn, work and play are changing and affecting our health."*

– Floyd J. Malveaux, M.D., Ph.D.
*Executive Director, Merck Childhood Asthma Network (MCAN)*

## CONTENTS






## EXECUTIVE SUMMARY

The outdoor and indoor environments in which we all work, live, learn, sleep, exercise, and socialize are affecting our health in ways that we are only beginning to understand. Pollutants in our environment have been linked to a myriad of health problems including cancers, developmental disorders, immune deficiencies, reproductive complications and cardiovascular, respiratory, endocrine, gastrointestinal, kidney, neurological, skin, sensory organ and liver diseases. This report will focus on substances in our environment associated with asthma, a common respiratory disease. It is estimated that 23 million Americans suffer from asthma, including 7.1 million children.[1] Most alarmingly, the number of cases is growing rapidly. According to the Global Initiative for Asthma, "there may be an additional 100 million persons with asthma by 2025" and asthma rates in children under the age of five have increased more than 160% from 1980 to 1994.[2]

The primary aim of this report was to develop a list of substances in our environment that are linked to asthma in an effort to improve awareness of the causes of the disease and inform decision-making in the design and construction of buildings and the specification of building products. The list was compiled by analysis of eight lists published by government agencies, academic sources, and third-party regulatory agencies, which this report will herein refer to simply as our sources. From this compilation we concluded that a wide variety of substances –374 total– have been linked to asthma. A subset of these are commonly used in the design and construction of buildings, and thus alternatives should be sought when possible. As there are no known thresholds for safe levels of exposure to asthmagens, precaution is necessary to prevent asthma caused or triggered by these substances.

**Please refer to the **Appendix** beginning on page 79 for a complete list of substances linked to asthma.*

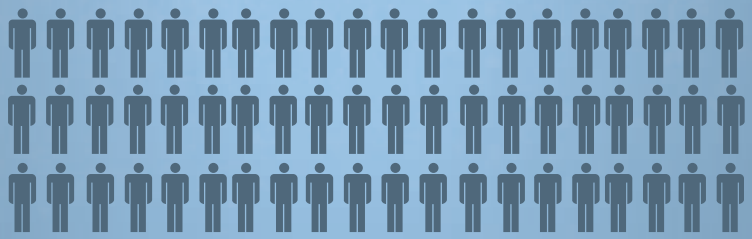
# Asthma By the Numbers

## EVERY DAY IN THE UNITED STATES

**11** people die as a result of asthma or asthma-related illness

**1,000** people are admitted to the hospital as a result of asthma or asthma-related illness

**5,000** people visit the emergency room as a result of asthma or asthma-related illness



**30,000** people have a asthma attack

**= 500** people

*Source: CDC National Asthma Program*
*http://www.cdc.gov/asthma/pdfs/breathing_easier_brochure.pdf*

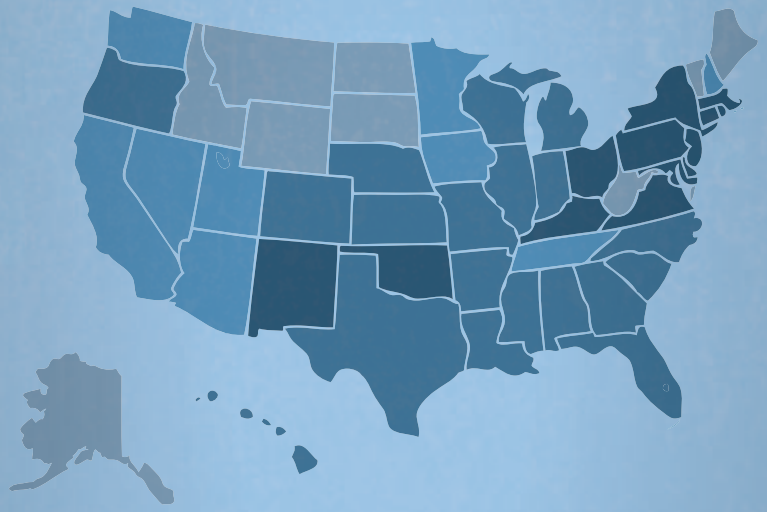
## DEFINING ASTHMA

The World Health Organization defines asthma as a chronic inflammatory lung disease characterized by recurrent attacks of breathlessness and wheezing that may occur at any time; which vary in severity and frequency from person to person.[3] The National Institutes of Health (NIH) includes "airflow obstruction, bronchial hyper-responsiveness, and inflammation" as common descriptions of the symptoms.[4] When asthma attacks occur, an asthma trigger, such as air pollution, allergens, exercise, stress, or certain chemicals in the indoor environment causes the airways of the lungs to narrow or become blocked, making it hard to breathe. It should be understood that asthma is a clinical diagnosis; there is no single test, biomarker, or gene specific for the disease.

Although people with asthma live with the disease all the time, they have asthmatic episodes or attacks only when something irritates their airways. During an episode, they may cough and wheeze or become short of breath. Sometimes an episode is so severe, emergency medical attention is needed to stabilize breathing. For the most part, the medical community does not know why some people have asthma and others do not. Although there is a genetic link to the condition, it is complex and not completely understood by the scientific community.[5]

Although most asthma attacks can be controlled without fatal consequences, thousands of people die from the disease every year. And while the disease often disproportionately kills people outside of the United States, 11 Americans die from asthma every day.[6] This equates to about 4,000 Americans dying each year from asthma related causes and complications, with another 7,000 deaths every year where asthma is a contributing factor.[7] Asthma is remedied with two types of medicines, one type (short-acting beta-agonists) for quick-relief to stop asthma symptoms and another type (inhaled corticosteroids) for long-term control to prevent symptoms.[8]

## Asthma By the Numbers




*Map indicates prevalence of asthma in adults in the United States.*
*Data based on the CDC National Health Survey.*
*Source: CDC / National Health Survey, The Global Initiative for Asthma. Data +/- 5%*

People living near noxious land uses are...
*(within specified distance buffers)*

**66%** more likely to be hospitalized for asthma...

**30%** more likely to be poor...

**13%** more likely to be a minority...

than those outside the buffers.

## ASTHMA IN THE GLOBAL CONTEXT

Asthma is a global public health problem. An estimated 300 million people worldwide suffer from asthma and the disease accounts for about 1 in every 250 deaths.[9] However, like many global public health issues, the burden of asthma is not distributed evenly worldwide. Asthma occurs in all countries regardless of their development levels, infrastructure and healthcare system. However, "most asthma-related deaths occur in low- and lower-middle income countries."[10] This is often because in many developing countries, persons suffering from asthma do not have access to basic asthma medications or adequate medical care. According to the Global Initiative for Asthma, "Many of the deaths are preventable, being due to suboptimal long-term medical care and delay in obtaining help during the final attack."[11]

Within the United States, many asthma sufferers live in low-income communities often in close proximity to source points of air pollution such as bus depots and factories. Juliana Maantay of the Department of Environmental, Geographic, and Geological Sciences at Lehman College, writes: "people living near (within specified distance buffers) noxious land uses were up to 66 percent more likely to be hospitalized for asthma, and were 30 percent more likely to be poor, and 13 percent more likely to be a minority than those outside the buffers."[12] Lower socioeconomic classes suffer from asthma related to poor indoor environmental quality as well. One reason for this discrepancy is that "dampness, mold, dirty carpeting, and pest infestations are often components of substandard housing, each leading to associated health problems, especially allergy symptoms and exacerbation of asthma attacks in asthmatics."[13]

Unfortunately, children are more susceptible to the disease, as their immune systems are still developing. According to the American Lung Association, "asthma is one of the most common chronic disorders in childhood, currently affecting an estimated 7.1 million children under 18 years; of which 4.1 million suffered from an asthma attack or episode in 2009."[14]

# Asthma By the Numbers

**IN THE UNITED STATES...**

**400,000 – 1,000,000**
children have their conditioned worsened by exposure to secondhand smoke

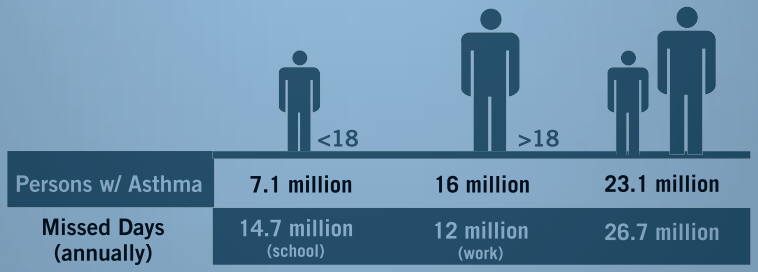
**4,100,000**
children suffered an asthma attack or episode in 2009

**7,100,000**
children under the age of 18 are affected by asthma

**14.4%**
percentage of children with asthma in Delaware, the state with the highest prevalence

**131**
children under 15 died from asthma in 2006

**5.2%**
percentage of children with asthma in Idaho and South Dakota, the states with the lowest rates




## COST OF ASTHMA

The annual cost of asthma is approximately $19.7 billion including nearly $10 billion in direct health care costs and over $8 billion for indirect costs such as lost earnings due to illness.[15] Asthma burdens our health system in other ways as well. Asthma leads to almost 13 million outpatient visits to the doctor and two million trips to the emergency room each year.[16] Worldwide, the number of disability-adjusted life years (DALYs) lost due to asthma is similar to that for diabetes, cirrhosis of the liver, or schizophrenia.[17]

The human cost of asthma reaches far beyond the financial burdens by putting undue strain on our schools and workplaces. Asthma has a direct impact on the education of our children. In fact, asthma is the leading cause of school absenteeism due to a chronic condition, accounting for more than 14.7 million missed school days per year.[18] Childhood asthma also accounts for many nights of interrupted sleep, limitation of daytime activities, and the disruption of family routines.[19] Asthma does not only affect those in school and is the "fourth leading cause of work absenteeism and diminished work productivity for adults, resulting in nearly 12 million missed or less productive workdays each year."[20]



## FRAMING THE ISSUE

This portion of the report will focus on the strong association between asthma and a myriad of substances linked to asthma. It is critical to focus on indoor air quality specifically because according to the Centers for Disease Control and Prevention, “many indoor environments have pollutant levels two to five times higher, and occasionally more than 100 times higher than outdoors levels due to occupant activities, building materials, and ambient conditions.”[21] Why is this critical? Because, according to the EPA, Americans spend 90% of their time indoors.[22] We eat, sleep, work, study, recreate, exercise and socialize indoors. This statistic is fundamental in the examination of environmentally-triggered health problems, especially asthma.

These high indoor pollutant levels are found in the most common places most families spend their days: school, workplace, and home. In the mid-1990s, one in five U.S. schools reported unsatisfactory indoor air quality, and one in four schools reported ventilation as unsatisfactory.[23] While many serious health conditions have been linked to poor indoor environmental quality, the following report will focus on all substances linked specifically to asthma. Well-known indoor substances linked to asthma include, but are not limited to: building materials and furnishings, dust mites, cockroaches, combustion sources, household cleaning, maintenance, personal care and hobby products, central heating and cooling systems, humidification devices, and outdoor sources such as radon, pesticides, and air pollution.[24] To date, there remain many substances that have been the focus of only limited research. This research has concentrated primarily on volatile organic compounds (VOCs) and formaldehyde. The following report brings forth a list of substances linked to asthma in order to bring more awareness to the strong association between asthma and substances we come into contact with every day.

# Asthma By the Numbers

## IMPACT ON OCCUPATIONS

**75** substances linked to asthma are found in paints and adhesives — two products found in most typical indoor environments. In addition to this baseline number, occupants can be exposed to other substances unique to their occupation.

**+13***

Substances linked to asthma that a *carpenter* comes into contact with every day at work

**+6***

Substances linked to asthma a worker in the *agriculture industry* comes into contact with every day at work

**+14***

Substances linked to asthma that a *dentist* comes into contact with every day at work

**+34***

Substances linked to asthma that worker in the *pharmaceutical industry* or chemical industry comes into contact with every day at work

**+5***

Substances linked to asthma that a *healthcare worker* comes into contact with every day at work

* This is the number of substances linked to asthma that are unique to the specific occupation noted, which is in addition to the 75 substances linked to asthma that are present in most indoor environments. These numbers refer to the number of times the occupation was noted in the compiled substance list (See pages 26-93 for complete list).

# Asthma Triggers and Asthmagens

For the purpose of this report, it is important to differentiate between asthma triggers and asthmagens. An asthma trigger is a substance or event that sets off asthma symptoms. There are many different asthma triggers, such as dust, paint, insect bites, stress or exercise. An asthmagen is any substance that can act as an asthma trigger when an individual is exposed to it via inhalation.

Asthmagens have been previously listed and classified for regulation of occupational exposures and other purposes. For example, the Association of Occupational and Environmental Clinics (AOEC) has developed a system of exposure codes [26] that is available online [27] to help clinicians systematically identify both existing and emerging occupational and environmental health concerns. Asthmagens are included in their listing with the supplemental designation "A." These are further classified by which criteria they meet. Exposures reviewed and those meeting criteria for sensitizer-induced asthma are designated "Rs"; those reviewed and meeting criteria for Reactive Airway Dysfunction Syndrome (RADS) are designated "Rr"; those reviewed and not meeting either set of criteria are designated "R". Substances that are generally accepted as asthmagens are designated "G". [28]

The Collaborative on Health and the Environment (CHE) is an international partnership committed to strengthening the scientific and public dialogue on the impact of environmental factors on human health and catalyzing initiatives to address these concerns. The CHE has developed a searchable toxicant and disease database that includes listings of asthma triggers. These are classified as either allergens or irritants and further categorized as Strong, Good, or Limited based on the strength of available evidence. [29]

In Europe, regulators have accepted a broader definition for this hazard classification. The European Union (EU) defines respiratory sensitizer as a substance that causes occupational asthma. The EU identifies individual, well-substantiated cases of such substances having caused asthma and considers the prevalence of such instances, relative to the number of people exposed. The EU criteria makes it clear that, to be classified as a respiratory sensitizer, a substance must induce or initiate the state of airways hypersensitivity—not provoke an existing condition.

## DEVELOPMENT OF A COMPREHENSIVE LIST OF ASTHMAGENS IN THE BUILT ENVIRONMENT

**Background**

The medical community is still striving to fully understand all the substances linked to asthma, but we do know that the disease's health implications are dangerous, costly, and widespread, and therefore the need for research into the causes of the disease is critical. According to the Global Initiative for Asthma, "The international patterns of asthma prevalence are not explained by the current knowledge of the causation of asthma. Research into the substances that are linked to asthma and the efficacy of primary and secondary intervention strategies represent key priority areas in the field of asthma research."[25]

For building professionals outside of the medical community, a priority is to compile existing research data on the presence of these substances in building materials into a form that is readily usable and that can be an environmental health reference for design and building professionals. The lists referred to in the previous examples are not considered exhaustive and none focus on the presence of the substances in building materials and furnishings.

**Purpose**

Toward meeting this need, our research team set out to compile data from existing lists produced by government, academic, and third-party sources on asthmagens in the built environment. This compilation should be a valuable resource for identifying asthmagens, and minimizing their use in building materials and furnishings, and ultimately contributing to our broader goals of fostering healthier built environments. This report provides a consolidated list of asthmagens, the products containing these substances, and the occupations associated with them (see page 19).

# METHODOLOGY

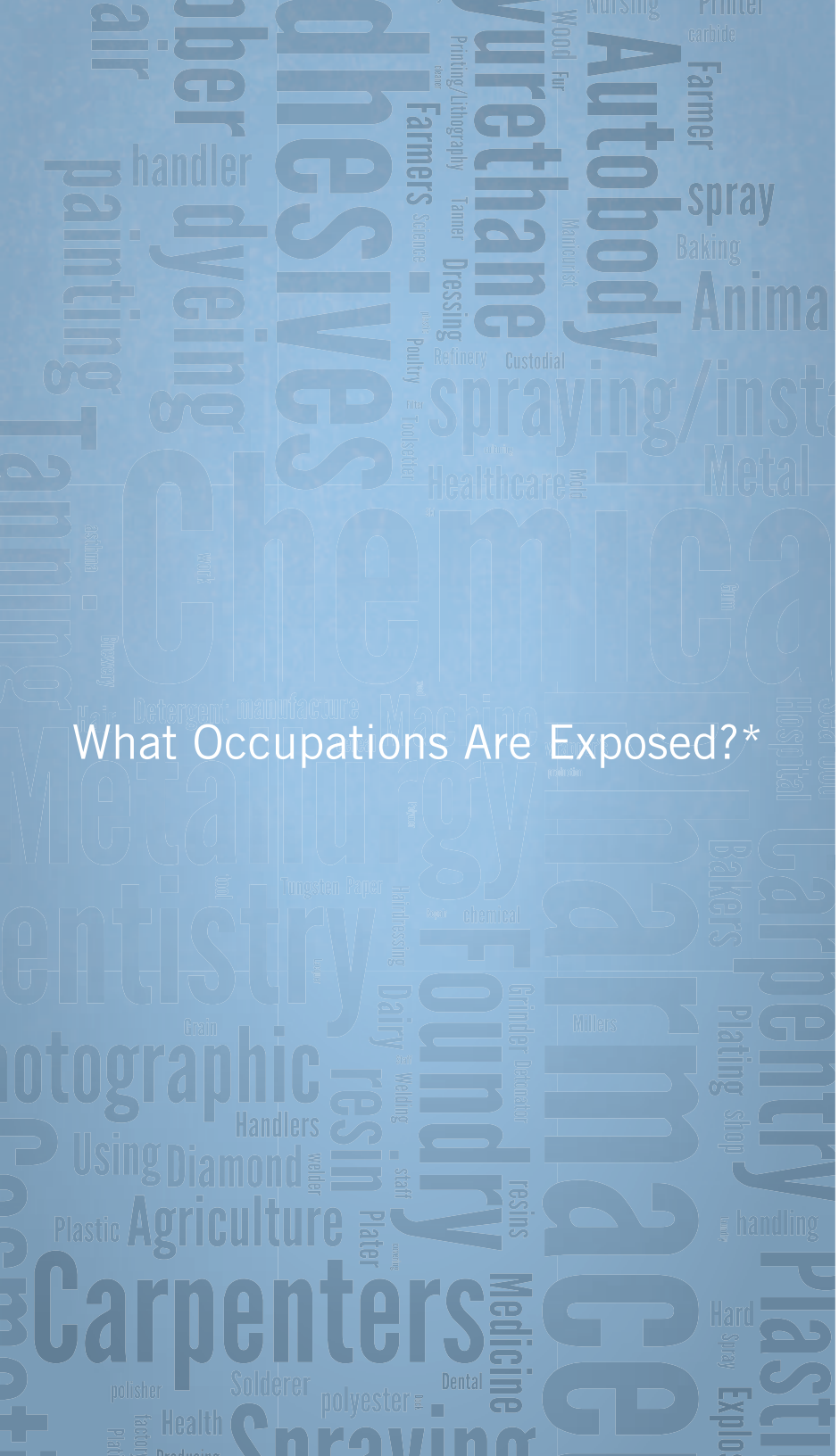
The data was compiled from eight publicly available lists produced by government agencies, academic sources, and third-party regulatory agencies. We used the eight most commonly referenced sources to compile the list, as noted in the reference source list on page 18. Beginning with the name of a substance, the research team cross-referenced each of the eight lists to identify how each data source classified the substance, then recorded if the substance was found in any building materials, and lastly, documented which occupations it was commonly associated with.

With no standard data-collection methodology across the eight lists, there is some inconsistency on how each data source found and classified information. For example, the New Jersey Department of Health (NJDOH) may identify a substance that causes asthma as a "known sensitizer" while the New York State Department of Health (NYSDOH) categorizes the same substances as "asthma triggers." Some listing agencies also further characterize substances by their mechanism of action e.g., allergen and irritants.

For the purpose and clarity of our compilation, we will refer to all substances on the various source lists that elicit asthma as asthmagens, regardless of their classification on the source lists. This follows recent trends reported by the Canadian Centre for Occupational Health and Safety (CCOHS) and others that focus less on categorizing asthma as immune or irritant, and more on classifying any chemical that can produce such a reaction as a respiratory sensitizer. "This represents a significant change in thinking, since the term respiratory sensitizer has traditionally been interpreted to imply an underlying immunological mechanism for the production of asthma. Due to the uncertainty and inconclusive evidence about the mechanism(s) involved in the development of asthma, the EU focuses on evidence that a substance has the ability to cause asthma, rather than on the existence of a specific underlying mechanism." [30]

The proposed criteria for the Global Harmonized System (GHS) of hazardous substances classification acknowledges that the mechanisms by which substances induce symptoms of asthma are not yet fully known, and that immunological mechanisms do not have to be demonstrated." [31]

After compiling the list of asthmagens we then cross referenced the substances with their known presence in building materials, which was based on information from the source lists and our own experience as building designers. This yielded the listing of asthmagens found in building materials (refer to pages 14-16). This list is intended to act as a resource and guideline for design and building professionals. It is organized into the MasterFormat system, the industry standard for specifications. This list should provide a framework for designers to understand what substances could potentially be found within a building product typology and alert them to ask questions about the product. For example, if specifying insulation (Division 7), one should be aware that based on publicly available scientific information, it may be likely to contain five substances linked to asthma, such as formaldehyde and styrene. It is critical to understand that not all product types will contain each substance listed, nor will each substance listed be found in every product manufactured within that product typology. Nonetheless, this list should act as a starting point to prompt a discussion between the designer and manufacturer or sales representative about the exact composition of a product. This very conversation could ultimately spark a broader discussion on how to bring more awareness and transparency to the often obscured building product industry.





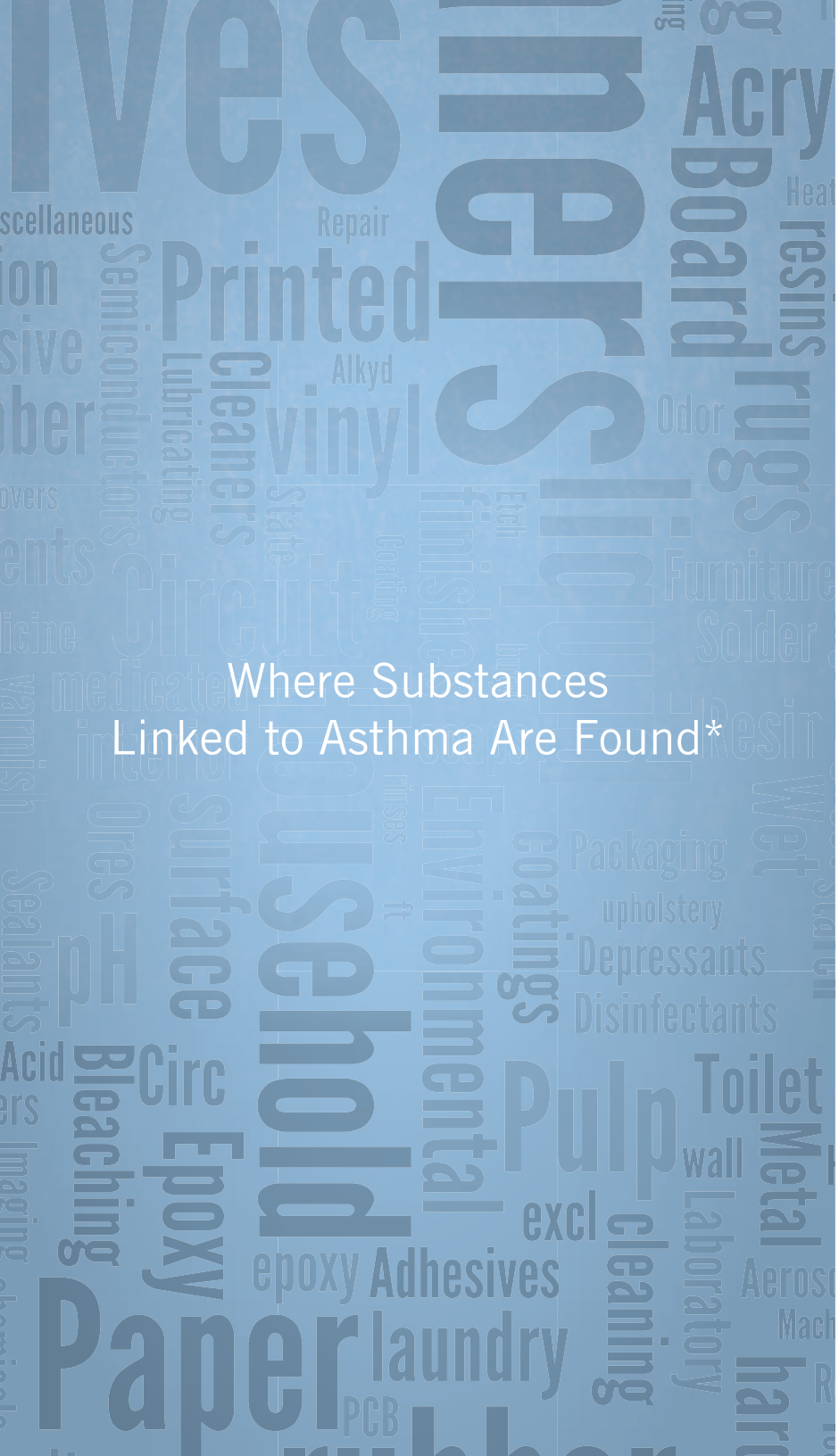

## SUMMARY OF FINDINGS

After assembling data from the eight source lists, we found a total of 374 different substances, both naturally occurring and man-made, that have known or suspected links to asthma*. A “known” asthmagen is something that is known to cause asthma, whereas a “suspected” asthmagen is highly believed (or suspected) by the regulatory agencies to cause asthma. Please refer to page 19 for the full list of 374 substances. While we understand that our compilation is just a piece of a much larger research undertaking, we are able to draw some conclusions from our examination of it. The most important finding is that the substances that are commonly linked with asthma are ubiquitous. From a kindergartner, to a nurse or a manufacturing plant worker, everyone is exposed to these substances in their respective environments. Seventy-five substances linked to asthma are found in paints and adhesives–two products found in most typical indoor environments. In addition to this baseline number, occupants can be exposed to other substances unique to their occupation. For example, a dentist comes into contact with 89 (75 base substances plus 14 unique to the profession) known or suspected substances that are associated with asthma in his or her work environment alone.

It is also critical to note at this point that there are many factors that determine how an individual will react to an asthmagen. For example, two individuals who both suffer from asthma may have similar levels of sensitivity to cat dander, but very different levels of sensitivity to benzene. It is also particularly difficult to predict the impacts of individual substances when individuals are exposed to multiple substances at the same time.

We would like to note that frequency of a substance being cited by many sources may be of questionable relevance to health and risk assessment since it is likely an artifact of the availability of published research. The reference sources do not identify all the studies used to determine if a substance should be included on its list, so it was not possible for us to establish if there is any relevance of the frequency of citation among the lists. Nevertheless, in the appendix we have listed the substances that are cited on at least six regulatory lists so that future researchers are aware of this pattern of regulatory concern.

**Please refer to **The List** beginning on page 32 for a list of occupations exposed to substances linked to Asthma.*






## SUMMARY OF FINDINGS (CONTINUED)

We also developed a list of substances that were found in ten or more products each. Of these, none were naturally occurring (except carmine, and formaldehyde in trace amounts). Some of the most commonly found substances include ammonium persulphate, carmine, sulfuric acid, and zinc chloride. Carmine, for example, is found in paints, artificial flowers, rouge and other cosmetics, and certain brands of juice, most notably red varieties of juice. Other notable substances are commonly found in nature. These include pollen, wood products, and buckwheat.

After an examination of substances commonly found in products, it is necessary to continue with a discussion of occupations that are most impacted by substances with links to asthma. Many individuals have or will develop asthma as a consequence of coming into contact with asthmagens in their workplace. The occupations that are most heavily impacted include manufacturing, agriculture, adhesives and plastics industry, and healthcare workers (for a list of occupations exposed please refer to page 92). It is fair to say that with few exceptions, every adult comes into contact with at least some substances that are linked to asthma at their place of work. A 2006 study found that "occupational exposures, including irritants, are important causes of adult onset asthma."[32] As adult on-set asthma increases, scientists and health care professionals are understanding that the quality of the occupants work and home environments are increasingly linked to the increase of asthma cases. ■

**Please refer to the **Appendix** beginning on page 79 for a list of where substances linked to asthma are found.*

# Where are Asthmagens found in building materials?

*The following is a list of asthmagens commonly found in building products and the master specification divisions they are associated with.*

## ALDEHYDES

### Formaldehyde

Div 06 Exterior Architectural Woodwork
Div 06 Exterior Finish Carpentry
Div 06 Glued-Laminated Construction
Div 06 Interior Architectural Woodwork
Div 06 Interior Finish Carpentry
Div 06 Miscellaneous Rough Carpentry
Div 06 Rough Carpentry
Div 06 Sheathing
Div 06 Shop-Fabricated Wood Trusses
Div 06 Wood Decking
Div 06 Wood Paneling
Div 07 Board Fireproofing
Div 07 Ethylene-Propylene-Diene-Monomer Membrane (EPDM) Roofing
Div 07 Fire-Resistive Joint Systems
Div 07 Penetration Firestopping
Div 09 Acoustical Metal Pan Ceilings
Div 09 Acoustical Panel Ceilings
Div 09 Acoustical Tile Ceilings
Div 09 Portland Cement Terrazzo Flooring
Div 09 Resinous Matrix Terrazzo Flooring
Div 09 Sheet Carpeting
Div 09 Static-Control Resilient Flooring
Div 09 Stretched-Fabric Wall Systems
Div 09 Tile Carpeting
Div 09 Wall Coverings
Div 09 Wood Flooring
Div 10 Wood Lockers
Div 12 Audio-Visual Support Furniture
Div 12 Banquettes
Div 12 Classroom Furniture
Div 12 Curtains and Drapes
Div 12 Custom Upholstered Seating
Div 12 Display Casework
Div 12 Dormitory Furniture
Div 12 Fixed Audience Seating
Div 12 Guest Room Furniture
Div 12 Healthcare Seating
Div 12 Interlocking Furniture
Div 12 Library Furniture
Div 12 Manufactured Wood Casework
Div 12 Office Furniture
Div 12 Patient Room Furniture
Div 12 Residential Casework
Div 12 Restaurant Furniture
Div 12 Systems Furniture
Div 12 Stage Curtains

### Glutaraldehyde

Div 12 Custom Upholstered Seating
Div 12 Office Furniture
Div 12 Restaurant Furniture
Div 12 Banquettes
Div 12 Guest Room Furniture
Div 12 Library Furniture

### Urea-Formaldehyde

Div 06 Exterior Architectural Woodwork
Div 06 Exterior Finish Carpentry
Div 06 Glued-Laminated Construction
Div 06 Interior Architectural Woodwork
Div 06 Interior Finish Carpentry
Div 06 Miscellaneous Rough Carpentry
Div 06 Rough Carpentry
Div 06 Sheathing
Div 06 Shop-Fabricated Wood Trusses
Div 06 Wood Decking
Div 06 Wood Paneling
Div 07 Fiberglass-Sandwich-Panel Assemblies
Div 07 Self-Adhering Sheet Waterproofing
Div 07 Thermal Insulation
Div 07 Water Repellents
Div 07 Water-Drainage exterior Insulation and Finish System (EIFS)
Div 08 Flush Wood Doors
Div 08 Stile and Rail Wood Doors
Div 09 Cementitious Coatings
Div 09 Elastomeric Coatings
Div 09 Exterior Painting
Div 09 Fabric-Wrapped Panels
Div 09 Fixed Sound-Absorptive Panels
Div 09 High-Performance Coatings
Div 09 High-Temperature-Resistant Coatings
Div 09 Interior Painting
Div 09 Intumescent Painting
Div 09 Multicolor Interior Finishing
Div 09 Resinous Flooring
Div 09 Staining and Transparent Finishing
Div 09 Wood Athletic Flooring
Div 09 Wood Flooring
Div 10 Wood Lockers
Div 12 Audio-Visual Support Furniture
Div 12 Banquettes
Div 12 Classroom Furniture
Div 12 Custom Upholstered Seating
Div 12 Display Casework
Div 12 Dormitory Furniture
Div 12 Fixed Audience Seating
Div 12 Guest Room Furniture
Div 12 Healthcare Seating
Div 12 Interlocking Furniture
Div 12 Library Furniture
Div 12 Manufactured Wood Casework
Div 12 Office Furniture
Div 12 Patient Room Furniture
Div 12 Residential Casework
Div 12 Restaurant Furniture
Div 12 Systems Furniture

# Where are Asthmagens found in building materials?

*The following is a list of asthmagens commonly found in building products and the master specification divisions they are associated with.*

## AMIDES

### 1,1'-Azobis(formamide)

Div 07 Thermal Insulation
Div 09 Resilient Base and Accessories
Div 09 Resilient Tile Flooring
Div 09 Sheet Carpeting
Div 09 Tile Carpeting
Div 09 Wall Coverings
Div 10 Wall and Door Protection
Div 12 Banquettes
Div 12 Curtains and Drapes
Div 12 Custom Upholstered Seating
Div 12 Fixed Audience Seating
Div 12 Guest Room Furniture
Div 12 Healthcare Seating
Div 12 Interlocking Furniture
Div 12 Library Furniture
Div 12 Office Furniture
Div 12 Patient Room Furniture
Div 12 Restaurant Furniture
Div 12 Systems Furniture
Div 13 Fabricated Structures
Div 15 Air Distribution
Div 15 Basic Materials and Methods
Div 15 Building Service Piping
Div 16 Wiring Methods
Div 33 Utilities

# Where are Asthmagens found in building materials?

*The following is a list of asthmagens commonly found in building products and the master specification divisions they are associated with.*

## AMINES

### (2-Aminoethyl)ethanolamine

Div 06 Rough Carpentry
Div 06 Sheathing
Div 09 Resinous Matrix Terrazzo Flooring
Div 09 Tiling
Div 09 Portland Cement Terrazzo Flooring
Div 09 Tiling & Stone Tiling

### N,N-Dimethylethanolamine
*Synonym: Dimethylethanolamine*

Div 06 Exterior Architectural Woodwork
Div 06 Exterior Finish Carpentry
Div 06 Interior Architectural Woodwork
Div 06 Interior Finish Carpentry
Div 06 Wood Decking
Div 06 Wood Paneling
Div 09 Exterior Painting
Div 09 Interior Painting
Div 09 Staining and Transparent Finishing
Div 09 Resinous Flooring
Div 09 Resinous Matrix Terrazzo Flooring

### Ethylenediamine
*Synonym: 1,2-Diaminoethane*

Div 06 Exterior Architectural Woodwork
Div 06 Exterior Finish Carpentry
Div 06 Glued-Laminated Construction
Div 06 Heavy Timber Construction
Div 06 Interior Architectural Woodwork
Div 06 Interior Finish Carpentry
Div 06 Miscellaneous Rough Carpentry
Div 06 Rough Carpentry
Div 06 Sheathing
Div 06 Wood Decking
Div 06 Wood Paneling
Div 07 Joint Sealants
Div 07 Thermal Insulation
Div 08 Flush Wood Doors
Div 08 Gasketing
Div 08 Stile and Rail Wood Doors
Div 09 Acoustical Metal Pan Ceilings
Div 09 Acoustical Panel Ceilings
Div 09 Acoustical Tile Ceilings
Div 09 Exterior Painting
Div 09 High-Performance Coatings
Div 09 Interior Painting
Div 09 Linear Metal Ceilings
Div 09 Resilient Athletic Flooring
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Sheet Carpeting
Div 09 Static-Control Resilient Flooring
Div 09 Stretched-Fabric Wall Systems
Div 09 Tile Carpeting
Div 10 Wood Lockers
Div 12 Audio-Visual Support Furniture
Div 12 Banquettes
Div 12 Classroom Furniture
Div 12 Custom Upholstered Seating
Div 12 Display Casework
Div 12 Dormitory Furniture
Div 12 Fixed Audience Seating
Div 12 Guest Room Furniture
Div 12 Healthcare Seating
Div 12 Interlocking Furniture
Div 12 Library Furniture
Div 12 Manufactured Wood Casework
Div 12 Office Furniture
Div 12 Patient Room Furniture
Div 12 Residential Casework
Div 12 Restaurant Furniture
Div 12 Systems Furniture
Div 15 Air Distribution
Div 15 Basic Materials and Methods

### Ethanolamine
*Synonym: 2-Aminoethanol*

Div 06 Exterior Finish Carpentry
Div 06 Glued-Laminated Construction
Div 06 Heavy Timber Construction
Div 06 Interior Finish Carpentry
Div 06 Miscellaneous Rough Carpentry
Div 06 Rough Carpentry
Div 06 Sheathing
Div 06 Wood Decking
Div 06 Wood Paneling
Div 08 Flush Wood Doors
Div 08 Stile and Rail Wood Doors
Div 09 Exterior Painting
Div 09 High-Performance Coatings
Div 09 Interior Painting
Div 09 Resilient Athletic Flooring
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Static-Control Resilient Flooring
Div 09 Stretched-Fabric Wall Systems
Div 09 Tile Carpeting
Div 10 Wood Lockers
Div 12 Audio-Visual Support Furniture
Div 12 Banquettes
Div 12 Classroom Furniture
Div 12 Custom Upholstered Seating
Div 12 Display Casework
Div 12 Dormitory Furniture
Div 12 Fixed Audience Seating
Div 12 Guest Room Furniture
Div 12 Healthcare Seating
Div 12 Interlocking Furniture
Div 12 Library Furniture
Div 12 Manufactured Wood Casework
Div 12 Office Furniture
Div 12 Patient Room Furniture
Div 12 Residential Casework
Div 12 Restaurant Furniture
Div 12 Systems Furniture

### Triethylenetetramine

Div 06 Exterior Architectural Woodwork
Div 06 Exterior Finish Carpentry
Div 06 Glued-Laminated Construction
Div 06 Interior Architectural Woodwork
Div 06 Interior Finish Carpentry
Div 06 Miscellaneous Rough Carpentry
Div 06 Rough Carpentry
Div 06 Sheathing
Div 06 Shop-Fabricated Wood Trusses
Div 06 Wood Decking
Div 06 Wood Paneling
Div 07 Fiberglass-Sandwich-Panel Assemblies
Div 07 Self-Adhering Sheet Waterproofing
Div 07 Thermal Insulation
Div 07 Water Repellents
Div 07 Water-Drainage exterior Insulation and Finish System (EIFS)
Div 08 Flush Wood Doors
Div 08 Stile and Rail Wood Doors
Div 09 Cementitious Coatings
Div 09 Elastomeric Coatings
Div 09 Exterior Painting
Div 09 Fabric-Wrapped Panels
Div 09 Fixed Sound-Absorptive Panels
Div 09 High-Performance Coatings
Div 09 High-Temperature-Resistant Coatings
Div 09 Interior Painting
Div 09 Intumescent Painting
Div 09 Metal Oxide Waterproofing
Div 09 Multicolor Interior Finishing
Div 09 Resinous Flooring
Div 09 Staining and Transparent Finishing
Div 09 Wood Athletic Flooring
Div 09 Wood Flooring
Div 10 Wood Lockers
Div 12 Audio-Visual Support Furniture
Div 12 Banquettes
Div 12 Custom Upholstered Seating
Div 12 Display Casework
Div 12 Dormitory Furniture
Div 12 Fixed Audience Seating
Div 12 Guest Room Furniture
Div 12 Healthcare Seating
Div 12 Interlocking Furniture
Div 12 Library Furniture
Div 12 Manufactured Wood Casework
Div 12 Office Furniture
Div 12 Patient Room Furniture
Div 12 Residential Casework
Div 12 Restaurant Furniture
Div 12 Systems Furniture

# Where are Asthmagens found in building materials?

*The following is a list of asthmagens commonly found in building products and the master specification divisions they are associated with.*

## ANHYDRIDES

### Maleic Anhydride

Div 06 Glued-Laminated Construction
Div 06 Miscellaneous Rough Carpentry
Div 06 Rough Carpentry
Div 06 Sheathing
Div 06 Shop-Fabricated Wood Trusses
Div 06 Wood Decking
Div 06 Wood Paneling
Div 07 Ethylene-Propylene-Diene-Monomer Membrane (EPDM) Roofing
Div 08 Flush Wood Doors
Div 08 Stile and Rail Wood Doors
Div 09 Cementitious Coatings
Div 09 Elastomeric Coatings
Div 09 Exterior Painting
Div 09 High-Performance Coatings
Div 09 High-Temperature-Resistant Coatings
Div 09 Interior Painting
Div 09 Intumescent Painting
Div 09 Multicolor Interior Finishing
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Resinous Flooring
Div 09 Staining and Transparent Finishing

### Methyltetrahydrophthalic Anhydride

Div 06 Glued-Laminated Construction
Div 06 Miscellaneous Rough Carpentry
Div 06 Rough Carpentry
Div 06 Sheathing
Div 06 Shop-Fabricated Wood Trusses
Div 06 Wood Decking
Div 06 Wood Paneling
Div 09 Resinous Flooring
Div 07 Board Fireproofing
Div 07 Fire-Resistive Joint Systems
Div 07 Penetration Firestopping
Div 09 Resinous Matrix Terrazzo Flooring

### Chlorine Compounds, Unspecified

Div 07 Siding
Div 08 Gasketing
Div 08 Vinyl Window
Div 09 Fabric-Wrapped Panels
Div 09 Resilient Athletic Flooring
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Static-Control Resilient Flooring
Div 09 Stretched-Fabric Wall Systems
Div 09 Tile Carpeting
Div 09 Wall Coverings
Div 10 Accordion Folding Partitions
Div 10 Awnings
Div 10 Banners
Div 10 Cubicles
Div 10 Flagpoles
Div 10 Operable Partitions
Div 10 Signage
Div 10 Toilet Compartments
Div 10 Toilet, Bath, and Laundry Accessories
Div 10 Visual Display Surfaces
Div 10 Walkway Covers
Div 10 Wall Protection
Div 11 Gymnasium Equipment
Div 11 Loading Dock Equipment
Div 11 Play Field Equipment and Structures
Div 11 Projection Screens
Div 12 Entrance Floor Grilles
Div 12 Horizontal Louver Blinds
Div 12 Site Furnishings
Div 12 Vertical Louver Blinds
Div 32 Chain Link Fences and Gates
Div 32 Playground Protective Surfacing
Div 33 Utilities

# Where are Asthmagens found in building materials?

*The following is a list of asthmagens commonly found in building products and the master specification divisions they are associated with.*

## CHROMIUM

### Chromium Metal and Compounds

Div 05 Decorative Metal
Div 05 Decorative Metal Railings
Div 05 Fabricated Metal Spiral Stairs
Div 05 Metal Fabrications
Div 05 Metal Gratings
Div 05 Metal Stairs
Div 05 Pipe and Tube Railings
Div 07 Asphalt Shingles
Div 07 Metal Roof Panels
Div 07 Metal Shingles
Div 07 Sheet Metal Flashing and Trim
Div 08 Detention Door Hardware
Div 08 Door Hardware
Div 08 Security windows
Div 08 Stainless-Steel Doors and Frames
Div 09 Exterior Painting
Div 09 Interior Painting
Div 10 Metal Storage Shelving
Div 10 Telephone Specialties
Div 10 Toilet Compartments
Div 10 Toilet, Bath, and Laundry Accessories
Div 12 Banquettes
Div 12 Curtains and Drapes
Div 12 Custom Upholstered Seating
Div 12 Fixed Audience Seating
Div 12 Guest Room Furniture
Div 12 Healthcare Seating
Div 12 Interlocking Furniture
Div 12 Library Furniture
Div 12 Office Furniture
Div 12 Patient Room Furniture
Div 12 Restaurant Furniture
Div 12 Systems Furniture
Div 13 Fabricated Structures

### Ammonium Bichromate

Div 05 Decorative Metal
Div 05 Decorative Metal Railings
Div 05 Fabricated Metal Spiral Stairs
Div 05 Metal Fabrications
Div 05 Metal Gratings
Div 05 Metal Stairs
Div 05 Pipe and Tube Railings
Div 07 Asphalt Shingles
Div 07 Metal Roof Panels
Div 07 Metal Shingles
Div 07 Sheet Metal Flashing and Trim
Div 07 Clay Roof Tiles
Div 07 Concrete Roof Tiles
Div 07 Manufactured Roof Expansion Joints
Div 07 Roof Accessories
Div 07 Roof Specialties
Div 07 Wood Shingles and Shakes
Div 08 Detention Doors and Frames
Div 08 Door Hardware
Div 08 Security windows
Div 08 Stainless-Steel Doors and Frames
Div 09 Exterior Painting
Div 09 Interior Painting
Div 10 Detention Accessories
Div 10 Metal Storage Shelving
Div 10 Signage
Div 10 Telephone Specialties
Div 10 Toilet Compartments
Div 10 Toilet, Bath, and Laundry Accessories
Div 11 Foodservice Equipment
Div 11 Residential Appliances
Div 12 Banquettes
Div 12 Curtains and Drapes
Div 12 Custom Upholstered Seating
Div 12 Fixed Audience Seating
Div 12 Guest Room Furniture
Div 12 Healthcare Casework
Div 12 Healthcare Seating
Div 12 Interlocking Furniture
Div 12 Library Furniture
Div 12 Office Furniture
Div 12 Patient Room Furniture
Div 12 Restaurant Furniture
Div 12 Systems Furniture
Div 12 Stage Curtains
Div 13 Fabricated Structures

# Where are Asthmagens found in building materials?

*The following is a list of asthmagens commonly found in building products and the master specification divisions they are associated with.*

## ISOCYNATES

### DIISOCYANATES Group Listing, Specific Compounds Not Referenced

Div 06 Glued-Laminated Construction
Div 06 Heavy Timber Construction
Div 06 Miscellaneous Rough Carpentry
Div 06 Rough Carpentry
Div 06 Sheathing
Div 06 Shop-Fabricated Wood Trusses
Div 06 Wood Decking
Div 06 Wood Paneling
Div 07 Joint Sealants
Div 07 Siding
Div 08 Flush Wood Doors
Div 08 Gasketing
Div 08 Stile and Rail Wood Doors
Div 09 Cementitious Coatings
Div 09 Elastomeric Coatings
Div 09 High-Performance Coatings
Div 09 High-Temperature-Resistant Coatings
Div 09 Interior Painting
Div 09 Intumescent Painting
Div 09 Multicolor Interior Finishing
Div 09 Resilient Athletic Flooring
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Sheet Carpeting
Div 09 Staining and Transparent Finishing
Div 09 Tile Carpeting
Div 09 Wall Coverings
Div 10 Wood Lockers
Div 12 Audio-Visual Support Furniture
Div 12 Banquettes
Div 12 Classroom Furniture
Div 12 Custom Upholstered Seating
Div 12 Display Casework
Div 12 Dormitory Furniture
Div 12 Fixed Audience Seating
Div 12 Guest Room Furniture
Div 12 Healthcare Seating
Div 12 Interlocking Furniture
Div 12 Library Furniture
Div 12 Manufactured Wood Casework
Div 12 Office Furniture
Div 12 Patient Room Furniture
Div 12 Residential Casework
Div 12 Restaurant Furniture
Div 12 Systems Furniture

### Hexamethylene diisocyanate (HDI)

Div 05 Decorative Metal
Div 05 Decorative Metal Railings
Div 05 Fabricated Metal Spiral Stairs
Div 05 Metal Fabrications
Div 05 Metal Gratings
Div 05 Metal Stairs
Div 05 Pipe and Tube Railings
Div 07 Metal Roof Panels
Div 07 Metal Shingles
Div 07 Metal Wall Panels
Div 07 Sheet Metal Flashing and Trim
Div 07 Sheet Metal Roofing
Div 07 Roof Accessories
Div 07 Roof Specialties
Div 08 Access Doors and Frames
Div 08 Aluminum Frames
Div 08 Aluminum Windows
Div 08 Aluminum-Framed Entrances and Storefronts
Div 08 Automatic Door Operators
Div 08 Detention Doors and Frames
Div 08 Detention Windows
Div 08 Folding Doors
Div 08 Glazing
Div 08 Hollow Metal Doors and Frames
Div 08 Intensive Care Unit/Critical Care Unit (ICU/CCU) Entrances
Div 08 Metal-Framed Skylights
Div 08 Overhead Coiling Doors
Div 08 Overhead Coiling Grilles
Div 08 Revolving Door Entrances
Div 08 Roof Windows
Div 08 Sectional Doors
Div 08 Security windows
Div 08 Sliding Aluminum-Framed Glass Doors
Div 08 Sliding Wood-Framed Glass Doors
Div 08 Sound Control Door Assemblies
Div 08 Steel Windows
Div 08 Unit Skylights
Div 09 Acoustical Panel Ceilings
Div 09 Acoustical Tile Ceilings
Div 09 High-Performance Coatings
Div 09 Linear Metal Ceilings
Div 09 Security Ceiling Assemblies
Div 09 Suspended Decorative Grids
Div 10 Detention Accessories
Div 10 Metal Storage Shelving
Div 10 Signage
Div 10 Telephone Specialties
Div 10 Toilet Compartments
Div 10 Toilet, Bath, and Laundry Accessories
Div 11 Foodservice Equipment
Div 12 Healthcare Casework

### Isophorone diisocyanate (IPDI)

Div 06 Glued-Laminated Construction
Div 06 Heavy Timber Construction
Div 06 Miscellaneous Rough Carpentry
Div 06 Rough Carpentry
Div 06 Sheathing
Div 06 Shop-Fabricated Wood Trusses
Div 06 Wood Decking
Div 06 Wood Paneling
Div 07 Elastomeric Sheet Waterproofing
Div 07 Metal Roof Panels
Div 07 Metal Shingles
Div 07 Metal Wall Panels
Div 07 Roof Accessories
Div 07 Roof Specialties
Div 07 Sheet Metal Flashing and Trim
Div 07 Sheet Metal Roofing
Div 07 Siding
Div 07 Thermal Insulation
Div 08 Flush Wood Doors
Div 08 Stile and Rail Wood Doors
Div 09 Cementitious Coatings
Div 09 Elastomeric Coatings
Div 09 Exterior Painting
Div 09 High-Performance Coatings
Div 09 High-Temperature-Resistant Coatings
Div 09 Interior Painting
Div 09 Intumescent Painting
Div 09 Multicolor Interior Finishing
Div 09 Staining and Transparent Finishing

# Where are Asthmagens found in building materials?

*The following is a list of asthmagens commonly found in building products and the master specification divisions they are associated with.*

## ISOCYNATES (continued)

### Methylene Diisocyanate (MDI)
*Synonym: 1,1'-Methylenebis(4-Isocyanatobenzene)*

Div 03 Water Stops
Div 04 PVC Flashing (Elastomeric Thermoplastic Flashing)
Div 04 Unit Masonry
Div 06 Interior Architectural Woodwork
Div 06 Interior Finish Carpentry
Div 07 Dampproofing and Waterproofing
Div 07 Joint Sealants
Div 07 Membrane Roofing
Div 07 Polyvinyl-Chloride (PVC) Roofing
Div 07 Self-Adhering Sheet Waterproofing
Div 07 Siding
Div 07 Thermoplastic Polyolefin (TPO) Roofing
Div 08 Gasketing
Div 08 Vinyl Window
Div 08 Flush Wood Doors
Div 08 Hollow Metal Doors and Frames
Div 08 Stile and Rail Wood Doors
Div 08 Structural-Sealant-Glazed Curtain Walls
Div 09 Fabric-Wrapped Panels
Div 09 High-Performance Coatings
Div 09 Resilient Athletic Flooring
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Resinous Flooring
Div 09 Static-Control Resilient Flooring
Div 09 Tile Carpeting
Div 09 Wall Coverings
Div 09 Fabric-Wrapped Panels
Div 09 Non-Structural Metal Framing
Div 10 Accordion Folding Partitions
Div 10 Awnings
Div 10 Banners
Div 10 Cubicles
Div 10 Operable Partitions
Div 10 Operable Partitions
Div 10 Signage
Div 10 Toilet Compartments
Div 10 Visual Display Surfaces
Div 10 Wall and Door Protection
Div 10 Wall Protection
Div 11 Gymnasium Equipment
Div 11 Loading Dock Equipment
Div 11 Play Field Equipment and Structures
Div 11 Projection Screens
Div 12 Entrance Floor Mats and Frames
Div 12 Horizontal Louver Blinds
Div 12 Site Furnishings
Div 12 Vertical Louver Blinds
Div 32 Chain Link Fences and Gates
Div 32 Playground Protective Surfacing
Div 33 Utilities

### Toluene diisocyanate (TDI)

Div 06 Exterior Architectural Woodwork
Div 06 Exterior Finish Carpentry
Div 06 Glued-Laminated Construction
Div 06 Heavy Timber Construction
Div 06 Heavy Timber Construction
Div 06 Interior Architectural Woodwork
Div 06 Interior Architectural Woodwork
Div 06 Interior Finish Carpentry
Div 06 Interior Finish Carpentry
Div 06 Interior Finish Carpentry
Div 06 Miscellaneous Rough Carpentry
Div 06 Miscellaneous Rough Carpentry
Div 06 Miscellaneous Rough Carpentry
Div 06 Rough Carpentry
Div 06 Rough Carpentry
Div 06 Rough Carpentry
Div 06 Sheathing
Div 06 Sheathing
Div 06 Sheathing
Div 06 Shop-Fabricated Wood Trusses
Div 06 Shop-Fabricated Wood Trusses
Div 06 Shop-Fabricated Wood Trusses
Div 06 Wood Decking
Div 06 Wood Decking
Div 06 Wood Decking
Div 06 Wood Paneling
Div 06 Wood Paneling
Div 06 Wood Paneling
Div 07 Metal Roof Panels
Div 07 Metal Shingles
Div 07 Metal Wall Panels
Div 07 Sheet Metal Flashing and Trim
Div 07 Sheet Metal Roofing
Div 07 Thermal Insulation
Div 07 Polyurethane Roof Coatings
Div 07 Roof Accessories
Div 07 Roof Specialties
Div 08 Flush Wood Doors
Div 08 Stile and Rail Wood Doors
Div 09 Resilient Athletic Flooring
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Static-Control Resilient Flooring
Div 09 Wood Flooring

# Where are Asthmagens found in building materials?

*The following is a list of asthmagens commonly found in building products and the master specification divisions they are associated with.*

## PHTHALATES

### Butyl Benzyl Phthalate (BBP)

Div 03 Water Stops
Div 04 PVC Flashing (Elastomeric Thermoplastic Flashing)
Div 04 Unit Masonry
Div 07 Dampproofing and Waterproofing
Div 07 Membrane Roofing
Div 07 Polyvinyl Chloride (PVC) Roofing
Div 07 Self-Adhering Sheet Waterproofing
Div 07 Siding
Div 08 Gasketing
Div 08 Vinyl Window
Div 09 Fabric-Wrapped Panels
Div 09 Resilient Athletic Flooring
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Static-Control Resilient Flooring
Div 09 Stretched-Fabric Wall Systems
Div 09 Tile Carpeting
Div 09 Wall Coverings
Div 10 Accordion Folding Partitions
Div 10 Awnings
Div 10 Banners
Div 10 Cubicles
Div 10 Demountable Partitions
Div 10 Signage
Div 10 Toilet Compartments
Div 10 Visual Display Surfaces
Div 10 Wall and Door Protection
Div 10 Wall Protection
Div 11 Gymnasium Equipment
Div 11 Loading Dock Equipment
Div 11 Play Field Equipment and Structures
Div 11 Projection Screens
Div 12 Entrance Floor Mats and Frames
Div 12 Horizontal Louver Blinds
Div 12 Site Furnishings
Div 12 Vertical Louver Blinds
Div 15 Building Service Piping
Div 16 Basic Electrical Materials and Methods
Div 16 Wiring Methods
Div 32 Chain Link Fences and Gates
Div 32 Playground Protective Surfacing
Div 33 Utilities

### Di(2-ethylhexyl)phthalate (DEHP)

Div 03 Water Stops
Div 04 PVC Flashing (Elastomeric Thermoplastic Flashing)
Div 04 Unit Masonry
Div 07 Dampproofing and Waterproofing
Div 07 Membrane Roofing
Div 07 Polyvinyl-Chloride (PVC) Roofing
Div 07 Self-Adhering Sheet Waterproofing
Div 07 Siding
Div 08 Gasketing
Div 08 Vinyl Window
Div 09 Fabric-Wrapped Panels
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Static-Control Resilient Flooring
Div 09 Stretched-Fabric Wall Systems
Div 09 Tile Carpeting
Div 09 Wall Coverings
Div 09 Resilient Athletic Flooring
Div 10 Awnings
Div 10 Banners
Div 10 Cubicles
Div 10 Operable Partitions
Div 10 Signage
Div 10 Toilet Compartments
Div 10 Visual Display Surfaces
Div 10 Wall and Door Protection
Div 10 Wall Protection
Div 11 Gymnasium Equipment
Div 11 Loading Dock Equipment
Div 11 Play Field Equipment and Structures
Div 11 Projection Screens
Div 12 Entrance Floor Mats and Frames
Div 12 Horizontal Louver Blinds
Div 12 Site Furnishings
Div 12 Vertical Louver Blinds
Div 15 Building Service Piping
Div 16 Basic Electrical Materials and Methods
Div 16 Wiring Methods
Div 32 Chain Link Fences and Gates
Div 32 Playground Protective Surfacing
Div 33 Utilities

### Di-n-hexylphthalate (DNHP)

Div 03 Water Stops
Div 04 PVC Flashing (Elastomeric Thermoplastic Flashing)
Div 04 Unit Masonry
Div 07 Dampproofing and Waterproofing
Div 07 Membrane Roofing
Div 07 Polyvinyl-Chloride (PVC) Roofing
Div 07 Self-Adhering Sheet Waterproofing
Div 07 Siding
Div 08 Gasketing
Div 08 Vinyl Windows
Div 09 Fabric-Wrapped Panels
Div 09 Resilient Athletic Flooring
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Static-Control Resilient Flooring
Div 09 Stretched-Fabric Wall Systems
Div 09 Tile Carpeting
Div 09 Wall Coverings
Div 10 Accordion Folding Partitions
Div 10 Awnings
Div 10 Banners
Div 10 Cubicles
Div 10 Signage
Div 10 Toilet Compartments
Div 10 Visual Display Surfaces
Div 10 Wall and Door Protection
Div 10 Wall Protection
Div 11 Gymnasium Equipment
Div 11 Loading Dock Equipment
Div 11 Play Field Equipment and Structures
Div 11 Projection Screens
Div 12 Entrance Floor Mats and Frames
Div 12 Horizontal Louver Blinds
Div 12 Site Furnishings
Div 12 Vertical Louver Blinds
Div 15 Building Service Piping
Div 16 Basic Electrical Materials and Methods
Div 16 Wiring Methods
Div 32 Chain Link Fences and Gates
Div 32 Playground Protective Surfacing
Div 33 Utilities

# Where are Asthmagens found in building materials?

*The following is a list of asthmagens commonly found in building products and the master specification divisions they are associated with.*

## PHTHALATES (continued)

### Di-n-pentyl phthalate (DNPP)

Div 03 Water Stops
Div 04 PVC Flashing (Elastomeric Thermoplastic Flashing)
Div 04 Unit Masonry
Div 07 Dampproofing and Waterproofing
Div 07 Membrane Roofing
Div 07 Polyvinyl-Chloride (PVC) Roofing
Div 07 Self-Adhering Sheet Waterproofing
Div 07 Siding
Div 08 Gasketing
Div 08 Vinyl Window
Div 09 Fabric-Wrapped Panels
Div 09 Resilient Athletic Flooring
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Static-Control Resilient Flooring
Div 09 Stretched-Fabric Wall Systems
Div 09 Tile Carpeting
Div 09 Wall Coverings
Div 10 Accordion Folding Partitions
Div 10 Awnings
Div 10 Banners
Div 10 Cubicles
Div 10 Operable Partitions
Div 10 Signage
Div 10 Toilet Compartments
Div 10 Visual Display Surfaces
Div 10 Wall and Door Protection
Div 10 Wall Protection
Div 11 Gymnasium Equipment
Div 11 Loading Dock Equipment
Div 11 Play Field Equipment and Structures
Div 11 Projection Screens
Div 12 Entrance Floor Mats and Frames
Div 12 Horizontal Louver Blinds
Div 12 Site Furnishings
Div 12 Vertical Louver Blinds
Div 15 Building Service Piping
Div 16 Basic Electrical Materials and Methods
Div 16 Wiring Methods
Div 32 Chain Link Fences and Gates
Div 32 Playground Protective Surfacing
Div 33 Utilities

### Dibutyl phthalate (DBP)

Div 03 Water Stops
Div 04 PVC Flashing (Elastomeric Thermoplastic Flashing)
Div 04 Unit Masonry
Div 07 Dampproofing and Waterproofing
Div 07 Membrane Roofing
Div 07 Polyvinyl-Chloride (PVC) Roofing
Div 07 Self-Adhering Sheet Waterproofing
Div 07 Siding
Div 08 Gasketing
Div 08 Vinyl Window
Div 09 Fabric-Wrapped Panels
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Static-Control Resilient Flooring
Div 09 Stretched-Fabric Wall Systems
Div 09 Tile Carpeting
Div 09 Wall Coverings
Div 09 Resilient Athletic Flooring
Div 10 Accordion Folding Partitions
Div 10 Awnings
Div 10 Banners
Div 10 Cubicles
Div 10 Operable Partitions
Div 10 Signage
Div 10 Toilet Compartments
Div 10 Visual Display Surfaces
Div 10 Wall and Door Protection
Div 10 Wall Protection
Div 12 Entrance Floor Mats and Frames
Div 12 Horizontal Louver Blinds
Div 12 Site Furnishings
Div 12 Vertical Louver Blinds
Div 15 Building Service Piping
Div 16 Basic Electrical Materials and Methods
Div 16 Wiring Methods
Div 32 Chain Link Fences and Gates
Div 32 Playground Protective Surfacing
Div 33 Utilities

### Diisobutyl phthalate (DIBP)

Div 03 Water Stops
Div 04 PVC Flashing (Elastomeric Thermoplastic Flashing)
Div 04 Unit Masonry
Div 07 Dampproofing and Waterproofing
Div 07 Membrane Roofing
Div 07 Polyvinyl-Chloride (PVC) Roofing
Div 07 Self-Adhering Sheet Waterproofing
Div 07 Siding
Div 08 Gasketing
Div 08 Vinyl Window
Div 09 Fabric-Wrapped Panels
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Static-Control Resilient Flooring
Div 09 Stretched-Fabric Wall Systems
Div 09 Tile Carpeting
Div 09 Wall Coverings
Div 09 Resilient Athletic Flooring
Div 10 Accordion Folding Partitions
Div 10 Awnings
Div 10 Banners
Div 10 Cubicles
Div 10 Operable Partitions
Div 10 Signage
Div 10 Toilet Compartments
Div 10 Visual Display Surfaces
Div 10 Wall and Door Protection
Div 10 Wall Protection
Div 11 Gymnasium Equipment
Div 11 Loading Dock Equipment
Div 11 Play Field Equipment and Structures
Div 11 Projection Screens
Div 12 Entrance Floor Mats and Frames
Div 12 Horizontal Louver Blinds
Div 12 Site Furnishings
Div 12 Vertical Louver Blinds
Div 15 Building Service Piping
Div 16 Basic Electrical Materials and Methods
Div 16 Wiring Methods
Div 32 Chain Link Fences and Gates
Div 32 Playground Protective Surfacing
Div 33 Utilities

# Where are Asthmagens found in building materials?

*The following is a list of asthmagens commonly found in building products and the master specification divisions they are associated with.*

## PHTHALATES (continued)

### Diisodecyl phthalate (DIDP)

Div 03 Water Stops
Div 04 PVC Flashing (Elastomeric Thermoplastic Flashing)
Div 04 Unit Masonry
Div 07 Dampproofing and Waterproofing
Div 07 Membrane Roofing
Div 07 Polyvinyl-Chloride (PVC) Roofing
Div 07 Self-Adhering Sheet Waterproofing
Div 07 Siding
Div 08 Gasketing
Div 08 Vinyl Window
Div 09 Fabric-Wrapped Panels
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Static-Control Resilient Flooring
Div 09 Stretched-Fabric Wall Systems
Div 09 Tile Carpeting
Div 09 Wall Coverings
Div 09 Resilient Athletic Flooring
Div 10 Accordion Folding Partitions
Div 10 Awnings
Div 10 Banners
Div 10 Cubicles
Div 10 Operable Partitions
Div 10 Signage
Div 10 Toilet Compartments
Div 10 Visual Display Surfaces
Div 10 Wall and Door Protection
Div 10 Wall Protection
Div 11 Gymnasium Equipment
Div 11 Loading Dock Equipment
Div 11 Play Field Equipment and Structures
Div 11 Projection Screens
Div 12 Entrance Floor Mats and Frames
Div 12 Horizontal Louver Blinds
Div 12 Site Furnishings
Div 12 Vertical Louver Blinds
Div 15 Building Service Piping
Div 16 Basic Electrical Materials and Methods
Div 16 Wiring Methods
Div 32 Chain Link Fences and Gates
Div 32 Playground Protective Surfacing
Div 33 Utilities

### Diisoheptyl phthalate

Div 03 Water Stops
Div 04 PVC Flashing (Elastomeric Thermoplastic Flashing)
Div 04 Unit Masonry
Div 07 Dampproofing and Waterproofing
Div 07 Membrane Roofing
Div 07 Polyvinyl-Chloride (PVC) Roofing
Div 07 Self-Adhering Sheet Waterproofing
Div 07 Siding
Div 08 Gasketing
Div 08 Vinyl Window
Div 09 Fabric-Wrapped Panels
Div 09 Resilient Athletic Flooring
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Static-Control Resilient Flooring
Div 09 Stretched-Fabric Wall Systems
Div 09 Tile Carpeting
Div 09 Wall Coverings
Div 10 Accordion Folding Partitions
Div 10 Awnings
Div 10 Banners
Div 10 Cubicles
Div 10 Operable Partitions
Div 10 Signage
Div 10 Toilet Compartments
Div 10 Visual Display Surfaces
Div 10 Wall and Door Protection
Div 10 Wall Protection
Div 11 Gymnasium Equipment
Div 11 Loading Dock Equipment
Div 11 Play Field Equipment and Structures
Div 11 Projection Screens
Div 12 Entrance Floor Mats and Frames
Div 12 Horizontal Louver Blinds
Div 12 Site Furnishings
Div 12 Vertical Louver Blinds
Div 15 Building Service Piping
Div 16 Basic Electrical Materials and Methods
Div 16 Wiring Methods
Div 32 Chain Link Fences and Gates
Div 32 Playground Protective Surfacing
Div 33 Utilities

### Diisononyl phthalate (DINP)

Div 03 Water Stops
Div 04 PVC Flashing (Elastomeric Thermoplastic Flashing)
Div 04 Unit Masonry
Div 07 Dampproofing and Waterproofing
Div 07 Membrane Roofing
Div 07 Polyvinyl-Chloride (PVC) Roofing
Div 07 Self-Adhering Sheet Waterproofing
Div 07 Siding
Div 08 Gasketing
Div 08 Vinyl Window
Div 09 Fabric-Wrapped Panels
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Static-Control Resilient Flooring
Div 09 Stretched-Fabric Wall Systems
Div 09 Tile Carpeting
Div 09 Wall Coverings
Div 09 Resilient Athletic Flooring
Div 10 Accordion Folding Partitions
Div 10 Awnings
Div 10 Banners
Div 10 Cubicles
Div 10 Operable Partitions
Div 10 Signage
Div 10 Toilet Compartments
Div 10 Visual Display Surfaces
Div 10 Wall and Door Protection
Div 10 Wall Protection
Div 11 Library Stack Systems
Div 11 Loading Dock Equipment
Div 11 Play Field Equipment and Structures
Div 11 Projection Screens
Div 12 Entrance Floor Mats and Frames
Div 12 Horizontal Louver Blinds
Div 12 Site Furnishings
Div 12 Vertical Louver Blinds
Div 15 Building Service Piping
Div 16 Basic Electrical Materials and Methods
Div 16 Wiring Methods
Div 32 Chain Link Fences and Gates
Div 32 Playground Protective Surfacing
Div 33 Utilities

# Where are Asthmagens found in building materials?

*The following is a list of asthmagens commonly found in building products and the master specification divisions they are associated with.*

## HARD METALS

*(Tungsten carbide and other metal carbides)*

Div 05 Decorative Metal
Div 05 Decorative Metal Railings
Div 05 Fabricated Metal Spiral Stairs
Div 05 Metal Fabrications
Div 05 Metal Stairs
Div 05 Pipe and Tube Railings
Div 08 Detention Door Hardware
Div 08 Door Hardware
Div 08 Security windows
Div 09 Exterior Painting
Div 09 Interior Painting
Div 10 Signage
Div 10 Telephone Specialties
Div 10 Toilet Compartments
Div 10 Toilet, Bath, and Laundry Accessories

# Where are Asthmagens found in building materials?

*The following is a list of asthmagens commonly found in building products and the master specification divisions they are associated with.*

## ACRYLATES

### Methyacrylates, Specific Compounds Not Referenced

Div 06 Glued-Laminated Construction
Div 06 Heavy Timber Construction
Div 06 Miscellaneous Rough Carpentry
Div 06 Rough Carpentry
Div 06 Sheathing
Div 06 Shop-Fabricated Wood Trusses
Div 06 Wood Decking
Div 06 Wood Paneling
Div 08 Flush Wood Doors
Div 08 Stile and Rail Wood Doors
Div 09 Cementitious Coatings
Div 09 Elastomeric Coatings
Div 09 Exterior Painting
Div 09 High-Performance Coatings
Div 09 High-Temperature-Resistant Coatings
Div 09 Interior Painting
Div 09 Intumescent Painting
Div 09 Multicolor Interior Finishing
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Staining and Transparent Finishing
Div 16 Lighting

### Methyl 2-cyanoacrylate

Div 06 Glued-Laminated Construction
Div 06 Miscellaneous Rough Carpentry
Div 06 Rough Carpentry
Div 06 Sheathing
Div 06 Shop-Fabricated Wood Trusses
Div 06 Wood Decking
Div 06 Wood Paneling
Div 08 Flush Wood Doors
Div 08 Stile and Rail Wood Doors
Div 09 Cementitious Coatings
Div 09 Elastomeric Coatings
Div 09 Exterior Painting
Div 09 High-Performance Coatings
Div 09 High-Temperature-Resistant Coatings
Div 09 Interior Painting
Div 09 Intumescent Painting
Div 09 Multicolor Interior Finishing
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Staining and Transparent Finishing
Div 16 Lighting

### Methyl Methacrylate

Div 06 Glued-Laminated Construction
Div 06 Miscellaneous Rough Carpentry
Div 06 Rough Carpentry
Div 06 Sheathing
Div 06 Shop-Fabricated Wood Trusses
Div 06 Wood Decking
Div 06 Wood Paneling
Div 08 Flush Wood Doors
Div 08 Stile and Rail Wood Doors
Div 09 Cementitious Coatings
Div 09 Elastomeric Coatings
Div 09 Exterior Painting
Div 09 High-Performance Coatings
Div 09 High-Temperature-Resistant Coatings
Div 09 Interior Painting
Div 09 Intumescent Painting
Div 09 Multicolor Interior Finishing
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Staining and Transparent Finishing
Div 16 Lighting

# Where are Asthmagens found in building materials?

*The following is a list of asthmagens commonly found in building products and the master specification divisions they are associated with.*

## PLASTICS

### EPOXY RESINS

Div 06 Exterior Architectural Woodwork
Div 06 Exterior Finish Carpentry
Div 06 Glued-Laminated Construction
Div 06 Heavy Timber Construction
Div 06 Interior Architectural Woodwork
Div 06 Interior Finish Carpentry
Div 06 Miscellaneous Rough Carpentry
Div 06 Rough Carpentry
Div 06 Sheathing
Div 06 Shop-Fabricated Wood Trusses
Div 06 Wood Decking
Div 06 Wood Paneling
Div 09 Exterior Painting
Div 09 High-Performance Coatings
Div 09 Interior Painting
Div 09 Resilient Athletic Flooring
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Resinous Flooring
Div 09 Static-Control Resilient Flooring
Div 09 Stretched-Fabric Wall Systems
Div 09 Wood Flooring
Div 08 Stile and Rail Wood Doors
Div 09 Resinous Matrix Terrazzo Flooring

### Plastic Dust

Div 03 Water Stops
Div 04 PVC Flashing (Elastomeric Thermoplastic Flashing)
Div 04 Unit Masonry
Div 07 Dampproofing and Waterproofing
Div 07 Polyvinyl-Chloride (PVC) Roofing
Div 07 Self-Adhering Sheet Waterproofing
Div 07 Siding
Div 07 Thermoplastic Sheet Waterproofing
Div 08 Fiberglass Reinforced Polyester Doors
Div 08 Gasketing
Div 08 Louvers And Vents
Div 08 Plastic Glazing
Div 08 Structured-Polycarbonate-Panel Assemblies
Div 08 Vinyl Window
Div 09 Resilient Athletic Flooring
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Tile Carpeting
Div 09 Wall Coverings
Div 10 Awnings
Div 10 Banners
Div 10 Cubicles
Div 10 Directories
Div 10 Display Cases
Div 10 Signage
Div 10 Toilet Compartments
Div 10 Visual Display Surfaces
Div 10 Wall and Door Protection
Div 10 Wall Protection
Div 11 Gymnasium Equipment
Div 11 Loading Dock Equipment
Div 11 Projection Screens
Div 12 Entrance Floor Mats and Frames
Div 12 Horizontal Louver Blinds
Div 12 Site Furnishings
Div 12 Vertical Louver Blinds
Div 13 Fabricated Structures
Div 32 Playground Protective Surfacing
Div 33 Utilities

### Polyvinyl Chloride [PVC] *(dust or heated, Thermal Decomposition Products)*

Div 03 Water Stops
Div 04 PVC Flashing (Elastomeric Thermoplastic Flashing)
Div 04 Unit Masonry
Div 07 Dampproofing and Waterproofing
Div 07 Membrane Roofing
Div 07 Polyvinyl-Chloride (PVC) Roofing
Div 07 Self-Adhering Sheet Waterproofing
Div 07 Siding
Div 08 Gasketing
Div 08 Vinyl Window
Div 09 Fabric-Wrapped Panels
Div 09 Resilient Athletic Flooring
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Static-Control Resilient Flooring
Div 09 Stretched-Fabric Wall Systems
Div 09 Tile Carpeting
Div 09 Wall Coverings
Div 10 Accordion Folding Partitions
Div 10 Awnings
Div 10 Banners
Div 10 Cubicles
Div 10 Toilet Compartments
Div 10 Visual Display Surfaces
Div 10 Wall and Door Protection
Div 10 Wall Protection
Div 11 Gymnasium Equipment
Div 11 Loading Dock Equipment
Div 11 Play Field Equipment and Structures
Div 11 Projection Screens
Div 12 Entrance Floor Mats and Frames
Div 12 Horizontal Louver Blinds
Div 12 Site Furnishings
Div 12 Vertical Louver Blinds
Div 32 Chain Link Fences and Gates
Div 32 Playground Protective Surfacing
Div 33 Utilities

# Where are Asthmagens found in building materials?

*The following is a list of asthmagens commonly found in building products and the master specification divisions they are associated with.*

## SOLVENTS, AROMATIC COMPOUNDS

### Styrene

Div 03 Water Stops
Div 04 PVC Flashing (Elastomeric Thermoplastic Flashing)
Div 04 Unit Masonry
Div 06 Exterior Architectural Woodwork
Div 06 Exterior Finish Carpentry
Div 06 Glued-Laminated Construction
Div 06 Heavy Timber Construction
Div 06 Interior Architectural Woodwork
Div 06 Interior Finish Carpentry
Div 06 Miscellaneous Rough Carpentry
Div 06 Sheathing
Div 06 Shop-Fabricated Wood Trusses
Div 06 Wood Decking
Div 06 Wood Paneling
Div 07 Composite Wall Panels
Div 07 Dampproofing and Waterproofing
Div 07 Membrane Roofing
Div 07 Metal Wall Panels
Div 07 Polyvinyl-Chloride (PVC) Roofing
Div 07 Self-Adhering Sheet Waterproofing
Div 07 Siding
Div 07 Thermal Insulation
Div 07 Styrene-Butadiene-Styrene (SBS)
Modified Bituminous Membrane Roofing
Div 07 Board Fireproofing
Div 07 Fire-Resistive Joint Systems
Div 07 Penetration Firestopping
Div 07 Under-Slab Vapor Barrier
Div 08 Flush Wood Doors
Div 08 Gasketing
Div 08 Stile and Rail Wood Doors
Div 08 Vinyl Window
Div 09 Exterior Painting
Div 09 Fabric-Wrapped Panels
Div 09 High-Performance Coatings
Div 09 Interior Painting
Div 09 Resilient Athletic Flooring
Div 09 Resilient Base and Accessories
Div 09 Resilient Sheet Flooring
Div 09 Resilient Tile Flooring
Div 09 Static-Control Resilient Flooring
Div 09 Stretched-Fabric Wall Systems
Div 09 Wood Flooring
Div 10 Accordion Folding Partitions
Div 10 Awnings
Div 10 Banners
Div 10 Cubicles
Div 10 Demountable Partitions
Div 10 Operable Partitions
Div 10 Signage
Div 10 Toilet Compartments
Div 10 Visual Display Surfaces
Div 10 Wall and Door Protection
Div 10 Wall Protection
Div 11 Gymnasium Equipment
Div 11 Loading Dock Equipment
Div 11 Play Field Equipment and Structures
Div 11 Projection Screens
Div 12 Audio-Visual Support Furniture
Div 12 Horizontal Louver Blinds
Div 12 Site Furnishings
Div 12 Vertical Louver Blinds
Div 15 Building Service Piping
Div 16 Basic Electrical Materials and Methods
Div 16 Lighting
Div 16 Wiring Methods
Div 32 Chain Link Fences and Gates
Div 32 Playground Protective Surfacing

### Toluene

Div 06 Exterior Architectural Woodwork
Div 06 Exterior Finish Carpentry
Div 06 Interior Architectural Woodwork
Div 06 Interior Finish Carpentry
Div 06 Wood Decking
Div 06 Wood Paneling
Div 08 Flush Wood Doors
Div 08 Stile and Rail Wood Doors
Div 09 Resilient Athletic Flooring
Div 09 Staining and Transparent Finishing
Div 09 Wood Athletic Flooring
Div 09 Wood Flooring
Div 10 Wood Lockers
Div 12 Audio-Visual Support Furniture
Div 12 Banquettes
Div 12 Classroom Furniture
Div 12 Custom Upholstered Seating
Div 12 Display Casework
Div 12 Dormitory Furniture
Div 12 Fixed Audience Seating
Div 12 Guest Room Furniture
Div 12 Healthcare Seating
Div 12 Interlocking Furniture
Div 12 Library Furniture
Div 12 Manufactured Wood Casework
Div 12 Office Furniture
Div 12 Patient Room Furniture
Div 12 Residential Casework
Div 12 Restaurant Furniture
Div 12 Systems Furniture

# Where are Asthmagens found in building materials?

*The following is a list of asthmagens commonly found in building products and the master specification divisions they are associated with.*

## NATURAL PRODUCTS

### Rosin
*Synonym: Colophony*

Div 09 Staining and Transparent Finishing

### Wood Dust

Div 06 Exterior Architectural Woodwork
Div 06 Exterior Finish Carpentry
Div 06 Interior Architectural Woodwork
Div 06 Interior Finish Carpentry
Div 06 Wood Decking
Div 06 Wood Paneling
Div 08 Flush Wood Doors
Div 08 Stile and Rail Wood Doors
Div 09 Wood Athletic Flooring
Div 09 Wood Flooring
Div 10 Wood Lockers
Div 12 Audio-Visual Support Furniture
Div 12 Banquettes
Div 12 Classroom Furniture
Div 12 Custom Upholstered Seating
Div 12 Display Casework
Div 12 Dormitory Furniture
Div 12 Fixed Audience Seating
Div 12 Guest Room Furniture
Div 12 Healthcare Seating
Div 12 Interlocking Furniture
Div 12 Library Furniture
Div 12 Manufactured Wood Casework
Div 12 Office Furniture
Div 12 Patient Room Furniture
Div 12 Residential Casework
Div 12 Restaurant Furniture
Div 12 Systems Furniture

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# Research Team and Qualifications

The Perkins+Will research team includes key members of the firm's research group and represents a collaboration across design disciplines, notably architecture, interior design, and planning. The team has over ten years of experience researching the environmental and health impacts of materials in the built and outdoor environments and has applied this thought leadership on a variety of projects from large healthcare facilities to urban elementary schools. Committed to industry transparency, the team's depth of understanding allows them to successfully raise awareness in the field through their advocacy and foster healthy environments through applied research and design.

**Research Team** Peter Syrett, AIA, LEED AP BD+C
Chris Youssef, NCIDQ, LEED AP ID+C
Kim Farrah, LEED AP, ID+C
Carolyn Roose, LEED Green Associate
Breeze Glazer, LEED AP BD+C

**Graphic Design** Kristina Buller

# Recommended Reading

**"Diagnosis and Management of Asthma"**
National Asthma Education and Prevention Program (NAEPP) Coordinating Committee (CC), coordinated by the National Heart, Lung, and Blood Institute (NHLBI) of the National Institutes of Health, 2007

**"Guide to Choosing Safer Products and Chemicals: Implementing Chemicals Policy in Healthcare."** Healthcare Without Harm, 2008

**"State of the Air"** American Lung Association, 2010

**"You Can Control Your Asthma—A Guide to Understanding Asthma and its Triggers** Center for Disease Control

**"Global Burden of Asthma"** Global Initiative for Asthma, 2009

# Substance List Reference Sources

Governmental Agencies

**European Union Health and Safety Executive**
http://www.hse.gov.uk/asthma/asthmagen.pdf

**Hazmap (Chemicals Associated with Occupational Asthma)**
http://www.haz-map.com/OA1.html

**New Jersey Department of Health and Senior Services – Industries and Asthmagens**
http://www.health.ny.gov/environmental/workplace/lung_disease_registry/toolkit/asthmagens.htm

**New York State Department of Health – Occupational Asthmagens**
http://www.state.nj.us/health/eoh/survweb/wra/agents.shtml

Third-Party Organizations

**The Collaborative on Health and the Environment (CHE)**
http://www.healthandenvironment.org/tddb/disease/?itemid=664
http://www.healthandenvironment.org/tddb/disease/?itemid=663

**The Table of Agents and Substances that cause Occupational Asthma (Asthmanet)**
http://www.remcomp.fr/asmanet/asmapro/agents.htm

**Association of Occupational and Environmental Clinics (AOEC)**
www.aoec.org/aoeccode.htm

Academic Sources

**Michigan State University Occupational & Environmental Medicine Table of Asthma**
http://www.oem.msu.edu/userfiles/file/Resources/AsthmaCausingAgents.pdf

# 2011 THE LIST

A compilation of 374 substances linked to asthma identified by government agencies, third-party regulatory agencies, and academic sources.

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Acarian materials [of or caused by mites or ticks]** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | n/a | Apple growers | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Acaridae (Grain Mite)** | n/a | AOEC:Asthmagen<br>NYSDOH: Asthma Triggers<br>Asmanet: Asthmagen | n/a | Grain handler<br>Baker<br><br>*Agriculture* | Association of Occupational and Environmental Clinics (AOEC)<br>New York State Department of Health – Occupational Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asmanet) |
| **Acetaldehyde (Acetic aldehyde, ethanol, ethyl aldehyde and methyl formaldehyde)** | 75-07-0 | CHE: Asthma - allergic (Good) | The commercial uses of acetaldehyde include the manufacture of acetic acid, acetic anhydride, pyridines, peracetic acid, penteerthritol, ethyl acetate, alkylamines, lactic acid and crotonaldehyde | *Multiple Industries* | The Collaborative on Health and the Environment (CHE) |
| **Acetylphosphoramidothioic Acid O,S-Dimethyl Ester (Acephate)** | 30560-19-1 | AOEC:Asthmagen<br>CHE: Asthma - Irritant Good | Pesticides | Landscaper<br><br>*Agriculture* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE) |
| **Acrolein (Acraldehyde; Acrylic Aldehyde; Allyl Aldehyde; Ethylene Aldehyde; 2-Propenal )** | 107-02-8 | CHE: Asthma - allergic (Good) | Used as a pesticide to control algae, weeds, bacteria, and mollusks<br>It is also used to make other chemicals | Landscaper<br><br>*Agriculture Chemical* | The Collaborative on Health and the Environment (CHE) |
| **Bioaerosols** | n/a | NJDOH: Known Sensitizer | Airborne particles that contains or released from natural organisms, most common industries are mining, office work, refuse collection processing but just limited to them | *Multiple Industries* | New Jersey Department of Health and Senior Services – Industries and Asthmagens |
| **Airborne carbon particles (soot)** | n/a | CHE: Asthma - Irritant Strong | n/a | *Multiple Industries* | The Collaborative on Health and the Environment (CHE) |
| **Alkyl(C12-C18) dimethyl ethylbenzyl ammonium chloride** | 68956-79-6 | AOEC: Asthmagen | Germicide | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC) |
| **Benzyl-C12-18-alkyldimethyl, chlorides** | 68391-01-5 | AOEC: Asthmagen | Used in conditioners, antistatic agent, detergent sanitizers; as a softener for textiles and paper products; antimicrobials, disinfection agents and sanitizers, algaecide, emulsifying agents and pigment dispersers | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC) |
| **Alternaria** | n/a | AOEC:Asthmagen<br>Asmanet: Asthmagen | Various fungi in the genus Alternaria, many of which cause plant diseases, chiefly blights and leaf spots | Bakers<br>Food<br>Landscaper<br><br>*Agriculture* | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asmanet) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Aluminum** | 7429-90-5 | AOEC:Asthmagen<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>CHE: Asthma - Allergic Strong<br>Asmanet: Asthmagen | Aluminum is the most widely used non-ferrous metal. Aluminum is used for foils and beverage cans, numerous building products including: storefronts, exterior wall panels, roofs, railings and guards, ornamental uses, windows, doors, siding, building wire and transmission lines, furniture; and in household items and consumer electronics<br>Powdered aluminum is used in paint and in pyrotechnics, and on numerous furniture systems components | Cable jointer<br>Factory worker<br>Metal worker<br>Solderer<br>Welder<br><br>*Construction*<br>*Metallurgy* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asmanet) |
| **Aluminum Chloride** | 7446-70-0 | AOEC: Asthmagen | | Diamond polisher<br>Hard metal grinder | Association of Occupational and Environmental Clinics (AOEC) |
| **Aluminum Oxide (Alumina; Activated Alumina; alpha-Alumina, Corundum)** | 1344-28-1 | AOEC: Asthmagen | Used in pigments, sodium vapor lamps and in manufacturing processes<br>It is also used as an abrasive | Janitorial/Cleaning<br><br>*Chemical Manufacturing*<br>*Brewery* | Association of Occupational and Environmental Clinics (AOEC) |
| **Aluminum Smelting** | n/a | Hazmap: Asthmagen | n/a | Potroom worker | Hazmap (Chemicals Associated with Occupational Asthma) |
| **Amines** | | CHE: Asthma - Allergic Strong<br>Asmanet: Asthmagen | Used in the manufacturing of azo dyes and in pharmaceutical industry | *Multiple Industries* | The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Aminoethylethanolamine (Aminoethyl Ethanol Amine, AEEA)** | 111-41-1 | AOEC:Asthmagen<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>CHE: Asthma - Irritant Good<br>Asmanet: Asthmagen | Used as feedstock in the production of detergents, emulsifiers, polishes, Pharmaceutical industry, corrosion inhibitors, and as a chemical intermediate | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asmanet) |
| **3-Amino-5-mercapto-1,2,4-triazole** | 16691-43-3 | AOEC: Asthmagen | n/a | Mold maker | Association of Occupational and Environmental Clinics (AOEC) |
| **Ammonia** | 7664-41-7 | CHE: Asthma - Irritant Strong | Used in fertilizers, cleaning products, in refrigeration – R717, antimicrobial agent, and textiles | Agriculture<br>Factory worker<br>HVAC mechanic<br>Janitorial worker | The Collaborative on Health and the Environment (CHE) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Ammonium Bichromate (Ammonium Dichromate)** | 7789-09-5 | AOEC:Asthmagen - RADS<br>Asmanet: Asthmagen | Used it is used in pyrotechnics and used as a catalyst and a source of pure nitrogen in the laboratory<br>In addition, it is also used as a mordant for dyeing pigments, in the manufacturing of alizarin, chrome alum, leather tanning industry and oil purification | Dying<br>Factory worker<br>Pyrotechnics | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asmanet) |
| **Ammonium Hexachloroplatinate (IV) (Ammonium chloroplatinate)** | 16919-58-7 | AOEC: Asthmagen | Used in platinum plating | Plater | Association of Occupational and Environmental Clinics (AOEC) |
| **Ammonium Persulphate** | 7727-54-0 | Hazmap: Asthmagen | Used in the manufacture of acrylic fibers, as a photochemical oxidizing agent, printed circuit board manufacturing, hot air solder leveling | Factory worker<br>Hairdresser | Hazmap (Chemicals Associated with Occupational Asthma) |
| **Amprovine (Amprolium, Amprol, Anticoccid)** | 9014-71-5 | CHE: Asthma - Allergic Strong<br>Asmanet: Asthmagen<br>AOEC: Asthmagen<br>MSU: Known Sensitizer<br>Hazmap: Asthmagen | Used as a drug that acts upon Coccidia parasites in poultry; also often mixed into animal feed | *Agriculture*<br>*Chemical*<br>*Pharmaceutical* | The Collaborative on Health and the Environment (CHE)<br>Asmanet -The Table of Agents and Substances that cause Occupational Asthma<br>Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>Hazmap (Chemicals Associated with Occupational Asthma) |
| **Anesthetic Gases, Halogenated** | n/a | AOEC: Asthmagen | Anesthetics | *Healthcare*<br>*Veterinary medicine* | Association of Occupational and Environmental Clinics (AOEC) |
| **Animal antigens** | n/a | CHE: Asthma - Allergic Strong | Animals, animal products and wastes | *Farming and Veterinary medicine* | The Collaborative on Health and the Environment (CHE) |
| **Aningeria dombeyi (Anegre, Aniegre, Aningeria, Aningre, Aningueri blanc, Kali, Kararo, Landojan, Landosan, M'boul, Mukali, Mukanga, Muna, N'kali, Osan, Tanganyika nuss, Tutu)** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer | Wood species | Carpenter<br><br>*Timber* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Anthemis nobilis (chamomile, ground apple, earth apple, English chamomile, garden chamomile, lawn chamomile, manzanilla, noble chamomile, Russian chamomile and white chamomile)** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer | A perennial plant used to flavor foods, in tisanes, perfumes, and cosmetics | Herbalist<br>Perfume factory worker<br><br>*Cosmetic*<br>*Food* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens |
| **Arabidopsis thaliana (Mouseear cress)** | n/a | AOEC: Asthmagen | Flowering plant | n/a | Association of Occupational and Environmental Clinics (AOEC) |
| **Aziridine (Azacyclopropane, Ethyleneimine)** | 151-56-4 | CHE: Asthma - Allergic Limited | Used in coatings and adhesives | Cabinetmakers | The Collaborative on Health and the Environment (CHE) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Azodicarbonamide (1,1'-Azobisformamide)** | 123-77-3 | AOEC:Asthmagen<br>EU: Known Respiratory Sensitizer<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>CHE: Asthma - Allergic Limited<br>Asmanet: Asthmagen | Rubber and plastic manufacturing associated with diazonium salts | *Plastic*<br>*Rubber* | Association of Occupational and Environmental Clinics (AOEC)<br>European Union Health and Safety Executive<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Bacillus subtilis (Subtilsins) enzymes** | 68038-70-0 | AOEC:Asthmagen<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen<br>MSU: Known Sensitizer | Detergents | *Laundaries*<br>*Detergent Manufacturing* | Association of Occupational and Environmental Clinics (AOEC)<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Balfourodendron riedelianum (Guatambu, Guatambu blanco, Marfim, Pau liso, Pau marfim)** | n/a | AOEC:Asthmagen<br>Asmanet: Asthmagen | Wood species | Boat builder<br>Carpenter<br><br>*Timber* | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Barn Mites** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer | n/a | *Agriculture* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Bat Guano** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | Fertilizers, bat inhabited areas | Janitorial worker<br>Spelunker<br><br>*Agriculture* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma |
| **Bee Moth** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer | Fish feed | Entomologist<br><br>*Aquaculture* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Benzalkonium Chloride (N-decyl-N-benzyl-N,N-dimethylammonium chloride (with n=10 for alkyl side chain))** | 8001-54-5 | AOEC:Asthmagen<br>Hazmap: Asthmagen<br>Asmanet: Asthmagen | Cleaning products, Antimicrobials | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Benzene** | 71-43-2 | CHE: Asthma - Irritant Limited | Fuels, solvents, general performance sealants (PVAC, butyl, vinyl, etc.), laundry starch preparations, lubricating oils, automotive chemicals, industrial chemical specialty products, and for scatter rugs/ bathmats (rugs 6 x 9 ft and smaller) | *Multiple Industries* | The Collaborative on Health and the Environment (CHE) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **1,2-Benzisothiazolin-3-one** | 2634-33-5 | Hazmap: Asthmagen | Pesticide products, marine anti-fouling agent, paints, varnishes, adhesives, sealers, and wood impregnating agent, and plaster products | *Multiple Industries* | Hazmap (Chemicals Associated with Occupational Asthma) |
| **Benzyl Butyl Phthalate** | 85-68-7 | AOEC:Asthmagen<br>Hazmap: Asthmagen | General performance sealants (PVAC, butyl, vinyl, etc.), interior water thinned coatings, synthetic resin and rubber adhesives, and specialty performance sealants | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma) |
| **Bis(2-Ethylhexyl) Phthalate (DEHP)** | 117-81-7 | AOEC:Asthmagen<br>CHE: Asthma - Irritant Strong<br>Hazmap: Asthmagen | Used as a plasticizer in PVC products, hydraulic fluid, and as a dielectric fluid in capacitors<br>Minor quantity of phthalates are also used in adhesives, caulk, sealants, and paint | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE)<br>Hazmap (Chemicals Associated with Occupational Asthma) |
| **Bis(tri-n-butyltin)oxide** | 56-35-9 | Hazmap: Asthmagen<br>NJDOH: Known Sensitizer | Flat water thinned interior paints and tinting bases, interior water thinned coatings, non-household pesticides, carpet deodorizer, wood preservative, needles used in venipuncture | *Multiple Industries* | Hazmap (Chemicals Associated with Occupational Asthma)<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens |
| **Black Henna** | n/a | Hazmap: Asthmagen<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | Textile and hair dyes | Dyer<br>Factory worker<br>Fur dyer<br>Hairdressing<br><br>*Textile* | Hazmap (Chemicals Associated with Occupational Asthma)<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Bombyx mori (Silkworm)** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | Silkworm, Silkworm Larva | *Silkworm Culturing* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma |
| **Bromelain** | 9001-00-7 | AOEC:Asthmagen<br>Asmanet: Asthmagen | A pineapple extract used as meat tenderizer and in folk medicine | Herbalist<br><br>*Food* | Association of Occupational and Environmental Clinics (AOEC)<br>Asmanet -The Table of Agents and Substances that cause Occupational Asthma |
| **BTC 776** | 53516-76-0 | AOEC: Asthmagen | Fungicide, algicide used in swimming pools, other applications | Landscaper<br>Painter<br><br>*Agriculture* | Association of Occupational and Environmental Clinics (AOEC) |
| **BTC 927** | 8045-22-5 | AOEC: Asthmagen | Disinfectant, sanitizer, fungicide | Landscaper<br>Painter<br><br>*Agriculture* | Association of Occupational and Environmental Clinics (AOEC) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Caesalpinia echinata (Fernambouc)** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer | Wood species | Carpenter<br><br>*Timber* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Caprolactam (Caprolactam, 1-Aza-2-cycloheptanone, 2-Azacycloheptanone, Capron PK4, Cyclohexanone iso-oxime, Extrom 6N, Hexahydro-2-azepinone, Hexahydro-2H-azepin-2-one (9CI), Hexanolactame)** | 105-60-2 | CHE: Asthma - Irritant Limited | Used in Nylon-6 | *Plastic* | The Collaborative on Health and the Environment (CHE) |
| **Capsicum annuum (Paprika)** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer<br>Asmanet: Asthmagen | Spice | *Food*<br>*Agriculture* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Captafol (Difolatan)** | 2425-06-1 | CHE: Asthma - Allergic Good | Fungicide used on food crops | *Agriculture*<br>*Chemical* | Hazmap (Chemicals Associated with Occupational Asthma)<br>The Collaborative on Health and the Environment (CHE) |
| **Carapichea ipecacuanha (Ipecacuanha)** | n/a | Asthmagen | Homeopathic medicine | Herbalist | Association of Occupational and Environmental Clinics (AOEC) |
| **Carbamates** | 302-11-4 | CHE: Asthma - Irritant Good | Used in insecticides, medicine, polyurethanes, and cosmetics | *Agriculture*<br>*Chemical* | The Collaborative on Health and the Environment (CHE) |
| **Carene (3,7,7-trimethylbicyclo[4.1.0] hept-3-ene)** | 13466-78-9 | AOEC: Asthmagen | Turpentine | n/a | Association of Occupational and Environmental Clinics (AOEC) |
| **Carmine (Natural Red #4)** | n/a | EU: Known Respiratory Sensitizer<br>Hazmap: Asthmagen<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | Artificial flowers, paints, crimson ink, rouge, and other cosmetics, and is also routinely added to food products such as yogurt and certain brands of juice, most notably those of the ruby-red variety; also used as a staining agent in microbiology | *Cosmetics*<br>*Dye*<br>*Food*<br>*Pharmaceutical*<br>*Textile* | European Union Health and Safety Executive<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma |
| **Casein** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | Glues, paints, and organic based plastics | Carpenter<br>Factory worker<br>Painter<br><br>*Food*<br>*Tanning* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Cassia senna L. Extract (Senna, Cassia acutifolia Delile, Cassia senna L., Cassia angustifolia Vahl. Senna alexandrina L. Sennoside A)** | 81-27-6 | Asthma - allergic (Limited) | Used in herbal and traditional medicine and laxatives | Herbalist<br><br>*Pharmaceutical* | The Collaborative on Health and the Environment (CHE) |
| **Cat** | n/a | AOEC:Asthmagen<br>Asmanet: Asthmagen | n/a | Animal handler<br><br>*Veterinary Medicine* | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Cedra libani (Cedar of Lebanon)** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer | Wood species | Carpenter<br><br>*Timber* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Ceiba pentandra (Kapok)** | n/a | AOEC:Asthmagen<br>Asmanet: Asthmagen | Wood species, textiles made from natrual fibers | Kapok Processors | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Cephalosporins** | 11111-12-9 | AOEC:Asthmagen<br>Asmanet: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>Hazmap: Asthmagen | Antibiotics | *Healthcare*<br>*Pharmaceutical* | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>Hazmap (Chemicals Associated with Occupational Asthma) |
| **Cetalkonium Chloride** | 122-18-9 | AOEC: Asthmagen | Used in antiseptic and disinfectant | *Chemical*<br>*Healthcare* | Association of Occupational and Environmental Clinics (AOEC) |
| **Chicken** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer | n/a | Livestock/ animal handler<br>Poultry processor<br><br>*Veterinary Medicine* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens |
| **Chlorendic anhydride** | 115-27-5 | Hazmap: Asthmagen<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>CHE: Asthma - Allergic Strong | Used in fire and corrosion resistances and UV stability for alkyd resins, polyurethanes, polyesters and epoxy resins | Epoxy resin factory worker<br>Mechanic<br>Plastic/ rubber worker<br><br>*Adhesives*<br>*Chemical*<br>*Dye*<br>*Pharmaceutical* | Hazmap (Chemicals Associated with Occupational Asthma)<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Collaborative on Health and the Environment (CHE) |
| **Chlorhexidine** | 55-56-1 | AOEC:Asthmagen<br>Hazmap: Asthmagen<br>Asmanet: Asthmagen | An antiseptic used mouthwash and other dental applications and non-dental applications too | Dentist<br>Dental Hygienist<br><br>*Healthcare* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Chlorine** | 7782-50-5 | AOEC:Asthmagen<br>CHE: Asthma - Irritant Good<br>Asmanet: Asthmagen | Used in making plastics, solvents for dry cleaning and metal degreasing, textiles, agrochemicals and pharmaceutical industry, insecticides, dyestuffs, household cleaning products | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Chloroamine (Monochloramine, Chloramide, Monochloroamine, Monochloramide, Chloroamine, Monochloroammonia)** | 10599-90-3 | CHE: Asthma - Irritant Good<br>Asmanet: Asthmagen | Used as a disinfectant in municipal water distribution systems, swimming pools, and in industry | *Multiple Industries* | The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Chloroamine T (N-chloro 4-methylbenzenesulfonamide, sodium)** | 127-65-1 | AOEC:Asthmagen<br>Asmanet: Asthmagen<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>EU: Known Respiratory Sensitizer | Used for disinfection and as an algicide, bactericide, germicide, for parasite control, and for drinking water disinfection | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Asmanet -The Table of Agents and Substances that cause Occupational Asthma<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>European Union Health and Safety Executive |
| **Chloroform (Formyl trichloride, Methane trichloride, Methyl trichloride, Methenyl trichloride)** | n/a | CHE: Asthma - Irritant Limited | Used as a solvent in labs | Laboratory worker | The Collaborative on Health and the Environment (CHE) |
| **Chlorophora excelsa (Iroko)** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer<br>Asmanet: Asthmagen | Wood species | Carpenter<br><br>*Timber* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Chlorothalonil 4,5,6-tetrachloroisophthalonitrile** | 1897-45-6 | AOEC:Asthmagen<br>Hazmap: Asthmagen<br>CHE: Asthma - Allergic Strong | Used pesticide and fungicide on crops; it is also used on golf courses and lawns, and as a preservative additive in some paints, resins, emulsions, and coatings | *Agriculture* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>The Collaborative on Health and the Environment (CHE) |
| **Chorella** | n/a | AOEC: Asthmagen | Algae grown for food | *Food* | Association of Occupational and Environmental Clinics (AOEC) |
| **Chromic Acid (Chromic(VI) acid Tetraoxochromic acid)** | 7738-94-5 | AOEC:Asthmagen<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | Used chrome plating process and is also used in ceramic glazes, and colored glass | Glass blower<br>Glass factory worker<br>Plater<br>Potter | Association of Occupational and Environmental Clinics (AOEC)<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Chromium** | 7440-47-3 | AOEC:Asthmagen<br>CHE: Asthma - Allergic Strong<br>MSU: Known Sensitizer<br>Hazmap: Asthmagen<br>NJDOH: Known Sensitizer<br>EU: Known Respiratory Sensitizer | Corrosion resistant plating and alloys such as stainless steel | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>European Union Health and Safety Executive |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Chromium (VI) / Hexavalent Chromium (Ammonium Dichromate; Barium Chromate; tert-Butyl Chomate; Calcium Chromate; Chromium Trioxide; Chromium (VI) ion; Hexavalent Chromium; Lead Chromate; Potassium Chromate; Potassium Dichromate; Silver Chromate; Sodium Chromate; Sodium Dichromate; Strontium Chromate; Zinc Chromate; Zinc Dichromate)** | 18540-29-9 | AOEC:Asthmagen<br>Asmanet: Asthmagen<br>EU: Known Respiratory Sensitizer<br>Hazmap: Asthmagen | Used in chrome plating, chrome chemical production, chromium pigments for paints and textile, wood preservation, leather tanning industry, and anti-corrosion coatings | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet)<br>European Union Health and Safety Executive<br>Hazmap (Chemicals Associated with Occupational Asthma) |
| **Chrysoperla carnea (Green Lacewing)** | n/a | AOEC: Asthmagen | An insect found in Asia, Europe and North America | n/a | Association of Occupational and Environmental Clinics (AOEC) |
| **Cibachrome Brilliant Scarlet 32** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer | | *Dye* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens |
| **Cichorium intybus L. (Chicory)** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer | A perennial plant cultivated for salad leaves or for its roots, which are baked, ground, and used as a coffee substitute and additive | *Food* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens |
| **Cimetidine (2-cyano- 1-methyl-3-(2-[(5-methyl- 1H-imidazol-4-yl)methylthio]ethyl)guanidine)** | 51481-61-9 | AOEC:Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>Hazmap: Asthmagen | Is a drug used to treat gastrointestinal ailments such as heartburn and ulcers | *Pharmaceutical* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>Hazmap (Chemicals Associated with Occupational Asthma) |
| **Cinnamomum zeylanicum (Cinnamon)** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer<br>Asmanet: Asthmagen | Spice | *Food* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Clam** | n/a | AOEC:Asthmagen<br>NYSDOH: Asthma Triggers<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | Food | *Food*<br>*Seafood* | Association of Occupational and Environmental Clinics (AOEC)<br>New York State Department of Health – Occupational Asthmagens<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Coal dust** | n/a | CHE: Asthma - Allergic Good | Coal mining, transporation and use as fuel | *Mining, fuel for electricity generation* | The Collaborative on Health and the Environment (CHE) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Cobalt** | 7440-48-4 | AOEC:Asthmagen<br>CHE: Asthma - Allergic Strong<br>EU: Known Respiratory Sensitizer<br>Hazmap: Asthmagen<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>Asmanet: Asthmagen | Used as an alloy, in batteries, pigments and paints, and in the electroplating process | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE)<br>European Union Health and Safety Executive<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Coffee Bean** | n/a | AOEC:Asthmagen<br>EU: Known Respiratory Sensitizer<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | Cultivated plant species | Coffee processor | Association of Occupational and Environmental Clinics (AOEC)<br>European Union Health and Safety Executive<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Colophony (Rosin, Greek pitch) [BALS 3A]** | 8050-09-7 | AOEC:Asthmagen<br>CHE: Asthma - Allergic Strong<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>Asmanet: Asthmagen | Used in printing inks, photocopying and laser printing paper, varnishes, adhesives (glues), soap, paper sizing, soda, soldering fluxes, sealing wax, a glazing agent in medicines and chewing gum, and it is also in some plasters and ointments | Solderer<br><br>*Adhesives*<br>*Electronics*<br>*Healthcare* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Cotton Dust** | n/a | CHE: Asthma - Irritant Strong<br>Asmanet: Asthmagen | Hanlding and processing of cotton | Cotton handler<br>Cotton processor | The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Cow Dander** | n/a | AOEC:Asthmagen<br>EU: Known Respiratory Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>Asmanet: Asthmagen | Farming, cattle processing | Animal handler<br>Laboratory worker<br><br>*Agriculture*<br>*Veterinary Medicine* | Association of Occupational and Environmental Clinics (AOEC)<br>European Union Health and Safety Executive<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Crab** | n/a | AOEC:Asthmagen<br>EU: Known Respiratory Sensitizer<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>Asmanet: Asthmagen | Seafood | Crab processing<br>Laboratory worker<br>Seafood processor<br><br>*Food* | Association of Occupational and Environmental Clinics (AOEC)<br>European Union Health and Safety Executive<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New York State Department of Health – Occupational Asthmagens<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Cricket** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers | n/a | Entomologist<br>Insect breeder<br><br>*Agriculture* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New York State Department of Health – Occupational Asthmagens<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens |
| **Cutting Oils (Oil Mist)** | 8012-95-1 | AOEC:Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>Hazmap: Asthmagen | Lubricants | Machine shop worker<br>Machinists<br>Mechanic<br>Tool setter<br><br>*Automobile* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>Hazmap (Chemicals Associated with Occupational Asthma) |
| **Cuttlefish** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer | Seafood; the bone of the cuttlefish is used for jewelers for molds and for caged birds as a source of calcium | Bird keepers<br>Jewelry polisher<br><br>*Seafood* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens |
| **Guar Gum** | 9000-30-0 | AOEC:Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | A vegetable gum used in the paper and textile industries, for ore flotation, in the manufacture of explosives and for hydraulic fracturing of oil and gas formations | Textile worker<br><br>*Candy*<br>*Cosmetic*<br>*Explosives*<br>*Food*<br>*Gum*<br>*Pharmaceutical*<br>*Printing and lithography* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Cyanoacrylates (methyl 2-cyanoacrylate, ethyl-2-cyanoacrylate, 2-octyl cyanoacrylate)** | n/a | AOEC:Asthmagen<br>Asmanet: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer | Adhesives | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **D(-)- Phenylglycine Acid Chloride ((R)-alpha-Aminophenylacetyl chloride hydrochloride)** | 39878-87-0 | AOEC:Asthmagen<br>Asmanet: Asthmagen | Used chiefly in the manufacture of ampicillin and other antibiotics | *Pharmaceutical* | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Dalbergia retusa (Cocabolla)** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer | Wood species | Carpenter<br><br>*Timber* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Daphnia** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer<br>Asmanet: Asthmagen | Planktonic crustaceans | aquatic toxicity testing<br>Fish food | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Dialkyl Methyl Benzyl Ammonium Chloride (Dialkyl Methyl BAC)** | 73049-75-9 | Asthma - irritant (Limited)<br>Hazmap: Asthmagen | Pesticides | *Multiple Industries* | Collaborative on Health and the Environment<br>Hazmap (Chemicals Associated with Occupational Asthma) |
| **Diazinon (Diethoxy-[(2-isopropyl-6-methyl-4-pyrimidinyl)oxy]-thioxophosphorane)** | 333-41-5 | AOEC:Asthmagen<br>CHE: Asthma - Irritant Good<br>Asmanet: Asthmagen | Insecticide | *Agriculture* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **1,1-Dichloroethane** | 75-34-3 | CHE: Asthma - Irritant Good | Used as a feedstock in chemical synthesis | *Chemical* | The Collaborative on Health and the Environment (CHE) |
| **Diazonium salt (Diazonium tetrafluoroborate and p-diethylaminobenzenediazonium chloride)** | 334-88-3 | AOEC:Asthmagen<br>CHE: Asthma - Allergic Good<br>EU: Known Respiratory Sensitizer<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer | Dyes | *Fluorine*<br>*Pulp/ Paper*<br>*Plastic*<br>*Rubber* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE)<br>European Union Health and Safety Executive<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens |
| **1,2-Dibromo-3-chloropropane (dibromochloropropane, DBCP)** | 96-12-8 | CHE: Asthma - Irritant Limited | Soil fumigant and nematocide | *Agriculture* | The Collaborative on Health and the Environment (CHE) |
| **Dicyclohexyl Phthalate (Phthalic acid, dicyclohexyl ester; DCHP; Phtalate de dicyclohexyle; 1,2-Benzenedicarboxylic acid, Dicyclohexyl ester; Diciclohexil Ftalato; Benzene-1,2-dicarboxylic acid, Dicyclohexyl ester)** | 84-61-7 | CHE: Asthma - Irritant Limited | Used as a plasticizer in PVC products<br>Minor quantity of phthalates are also used in adhesives, caulk, sealants, paint to improve work performance | *Multiple Industries* | The Collaborative on Health and the Environment (CHE) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Didecyl Dimethyl Ammonium Chloride** | 7173-51-5 | AOEC:Asthmagen<br>Hazmap: Asthmagen | A biocide used for the control of algae, bacteria, fungi or molluscs in the following use sites: indoor hard surfaces (e.g. floors, walls, countertops), other indoor surfaces (e.g. carpet, laundry), industrial process fluids (e.g. open cooling water tower system, oil field water flood or salt water disposal systems, recirculating water cooling towers) and wood | Carpenter<br>HVAC mechanic<br>Janitorial worker | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma) |
| **Diesel exhaust** | n/a | CHE: Asthma - Irritant Strong | Emission from combustion engines | Mechanic | The Collaborative on Health and the Environment (CHE) |
| **Diethanolamine (DEA, Diethanolamine, 2,2'-Iminobisethanol, Iminodiethanol, Bis(hydroxyethyl) amine, N,N-Bis(2-hydroxyethyl) amine, 2-[(2-Hydroxyethyl) amino]ethanol, 2,2'-Dihydroxydiethylamine, Diolamine, N-Ethylethanamine)** | 111-42-2 | AOEC:Asthmagen | Used as a wetting agent in shampoos, lotions, creams and other cosmetics; brake fluid, degreasers and antifreeze, in some pesticide formulations, as a so-called inert ingredient<br>It can also be found in some intravenous medications as solvent | Factory worker | Association of Occupational and Environmental Clinics (AOEC) |
| **Di-isocyanates** | 1125 (See isocyanates) | AOEC:Asthmagen<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers | Polyurethane | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens |
| **Dimethoate** | 60-51-5 | AOEC:Asthmagen<br>CHE: Asthma - Irritant Good | Insecticide | *Agriculture* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE) |
| **Dimethyl Sulfate** | 77-78-1 | CHE: Asthma - Irritant Limited | Used as a as a reagent for the methylation of phenols, amines, and thiols | Laboratory worker<br>*Chemical* | The Collaborative on Health and the Environment (CHE) |
| **Dimethylaminopropylamine (DMAPA, N,N-Dimethyl-1,3-propanediamine)** | 109-55-7 | Asthmagen (AOEC)<br>Hazmap: Asthmagen<br>NYSDOH: Asthma Triggers | Epoxy adhesives | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>New York State Department of Health – Occupational Asthmagens |
| **Dimethylethanolamine (N,N-Dimethylethanolamine)** | 108-01-0 | AOEC:Asthmagen<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>NJDOH: Known Sensitizer | Used as a curing agent for polyurethanes and epoxy resins | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New York State Department of Health – Occupational Asthmagens<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens |
| **Dioctyl phthalate (DOP, Di-sec-octyl phthalate)** | 117-84-0 | Hazmap: Asthmagen<br>Asmanet: Asthmagen | Synthetic resin and rubber adhesives | PVC production worker | Hazmap (Chemicals Associated with Occupational Asthma)<br>The Table of Agents and Substances that cause Occupational Asthma (Asmanet) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Dioscorea batatas (Chinese Yam)** | n/a | AOEC: Asthmagen | A food and also used in traditional Chinese medicine | Herbalist<br><br>*Food* | Association of Occupational and Environmental Clinics (AOEC) |
| **Disospyros crassiflora (Ebony)** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer<br>Asmanet: Asthmagen | Wood species | Carpenter | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **D-Limonene** | 5989-27-5<br>138-86-3 | AOEC: Asthmagen (Sensitizer ) | Used in cosmetic products, as an odor constituent, food manufacturing, fragrant in perfumery; it is also used as botanical insecticide; a solvent for cleaning purposes, Used for removal of oil from machine parts, a paint stripper, a solvent in some model airplane glues, and in air fresheners | Factory worker<br>Food<br>Janitorial worker | Association of Occupational and Environmental Clinics (AOEC) |
| **Dodecyl-dimethyl-benzylammonium Chloride (Lauralkonium chloride, Lauryl dimethyl benzyl ammonium chloride )** | 139-07-1 | AOEC:Asthmagen<br>Hazmap: Asthmagen | Used as algicide and germicide for industrial recycling water in oil fields, chemical plants and in other industries | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma) |
| **Drimaren Brilliant Blue K-BL (Drimarene brilliant blue;drimarene brilliant blue K-bl;DRIMARENE BRILLIANT BLUE K-BL;C.I. Reactive blue 114, Reactive Blue 114)** | 51811-44-0 | AOEC:Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer | Dye | *Dye* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens |
| **Drimaren Brilliant Yellow K-3GL** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer | Dye | *Dye* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens |
| **Echinodorus plasmosus larva** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer | Fish feed | Fish-food handler | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Egg Lysozyme** | n/a | AOEC:Asthmagen<br>CHE: Asthma - Allergic Strong | Food products | Baker<br>*Food* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE) |
| **Egg Protein** | n/a | AOEC:Asthmagen - Generally Accepted<br>EU: Known Respiratory Sensitizer<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>Asmanet: Asthmagen | Food products | Baker<br><br>*Food* | Association of Occupational and Environmental Clinics (AOEC)<br>European Union Health and Safety Executive<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Enzymes** | n/a | CHE: Asthma - Allergic Strong<br>Asmanet: Asthmagen<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers | Enzymes are proteins that increase the rates of chemical reactions, which can be founded in a multitude different types of products | Baker<br>Detergent factory worker<br>Laboratory worker<br>Paper/ pulp manufacturing<br><br>*Cosmetic*<br>*Dairy*<br>*Enzyme*<br>*Food*<br>*Pharmaceutical*<br>*Tanning*<br>*Textile* | The Collaborative on Health and the Environment (CHE)<br>Asmanet -The Table of Agents and Substances that cause Occupational Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens |
| **Ephestia kuehniella (Mediterranean Flour Moth)** | n/a | AOEC:Asthmagen<br>Asmanet: Asthmagen | Grain products | Baker<br>Food processing | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **EPO 60** | 142443-98-9 | AOEC:Asthmagen<br>Hazmap: Asthmagen | Used as an epoxy resin hardening agent | Janitorial worker<br>Mold maker | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma) |
| **Epoxy Resins** | Multiple CAS numbers | AOEC:Asthmagen<br>CHE: Asthma - Allergic Good<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers | Adhesives, paints | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE)<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Ethanolamine (2-Aminoethanol, Monoethanolamine)** | 141-43-5 | AOEC:Asthmagen<br>CHE: Asthma - Allergic Good<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>Asmanet: Asthmagen | Used in wood preservers, cleaners, adhesives, stripping agent, paint manufacture (hydrocarbon solvents), metal degreasing (Terpene cleaners), wood office furniture, wood office work surfaces (modular systems), household hard surface cleaners (dry), household hard surface cleaners (liquid), other polishing preparations and related products, soaps including: mechanics and medicated, specialty cleaning and sanitation products, wood furniture, wood surfaces, waterless hand cleaner, automobile body polish and cleaners, automotive windshield washer fluid, bathroom tub and tile cleaners, disinfectants (nonagricultural), drain pipe solvents, floor polish, fungicides, furniture polish and cleaners, glass window cleaning preparations, hair coloring preparations (bleaches, dyes, rinses, tints, etc.), household liquid laundry detergents, household rug and upholstery cleaners, household synthetic light duty detergent (liquid), lubricating oils, miscellaneous paint-related products, alkaline household detergents, Other alkaline non-household detergents (liquid), automotive chemicals, Other hair preparations, including heat setting wave solutions, pigment dispersions & ink vehicles, laundry aids (including ironing aids and dry cleaning spotting pretreatment)<br><br>polishing preparations and related products, oven cleaners, packaging inks: water types, paint and varnish removers | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet)<br>New York State Department of Health – Occupational Asthmagens |
| **Ethoxylated bisphenol A diacrylate** | 24447-78-7 | CHE: Asthma - Allergic Strong<br>Hazmap: Asthmagen | Used in adhesive, paint, and ink | Auto body shop worker<br>Printer | Hazmap (Chemicals Associated with Occupational Asthma)<br>The Collaborative on Health and the Environment (CHE) |
| **ethyl 4-methylthio-m-tolyl isopropylphosphoramidate (Fenamiphos or Nemacur)** | 22224-92-6 | AOEC:Asthmagen<br>CHE: Asthma - Irritant Good | Insecticide | *Agriculture Chemical* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE) |
| **Ethyl Cyanoacrylate (Ethyl-2-cyanoacrylate)** | 7085-85-0 | CHE: Asthma - Allergic Strong<br>Hazmap: Asthmagen | Adhesives | *Multiple Industries* | The Collaborative on Health and the Environment (CHE)<br>Hazmap (Chemicals Associated with Occupational Asthma) |
| **Ethyl methacrylate** | 97-63-2 | CHE: Asthma - Allergic Strong<br>Hazmap: Asthmagen | Used is a base material for coatings and adhesives; also in resins, solvent, coatings, adhesives, oil additives, dental products, textile emulsions, leather and paper finishing, and as a chemical intermediate in organic synthesis | Manicurist<br>Factory worker | The Collaborative on Health and the Environment (CHE)<br>Hazmap (Chemicals Associated with Occupational Asthma) |
| **Ethylene amines** | n/a | Asthma - irritant (Strong)<br>MSU: Known Sensitizer | Ethyl amines are used in: detergents, paints, adhesives, fuel<br>oils, make-up soaps, Pharmaceutical industry, concrete, asphalt, pulp and paper | *Multiple Industries* | The Collaborative on Health and the Environment (CHE)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Ethylene Oxide (EO, Oxirane)** | 75-21-8 | AOEC:Asthmagen<br>Hazmap: Asthmagen<br>CHE: Asthma - irritant (good)<br>Asmanet: Asthmagen | The principle use is in the manufacture of ethylene glycol is in automotive antifreeze, explosives, cellophane, polyester resins, synthetic fibers and rubbers, and hydraulic fluids<br>Used as a sterilant gas | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asmanet) |
| **Ethylenediamine (EN, 1,2-Diaminoethane)** | 107-15-3 | AOEC:Asthmagen<br>CHE: Asthma - Allergic Strong<br>Hazmap: Asthmagen<br>Asmanet: Asthmagen<br>MSU: Known Sensitizer<br>EU: Known Respiratory Sensitizer | Used in the manufacturing of circuit boards (printed circuit board wire materials), herbicides, pulp and paper, vulcanized rubber, and as an impregnation agents for fibrous materials; Also used in: organic laboratory chemicals, synthetic and organic tanning industry agents, paper coatings, photochemicals (hardeners), formaldehyde, tufted carpets and rugs, particleboard, floor underlayment, medium density fiberboard (MDF), wood furniture, vinyl coated wallcovering, interior solvent thinned paints, alkyd semi-gloss paint, latex flat paint, latex primer, vegetable adhesives (starches), synthetic resin and rubber adhesives, general performance sealants, glass wool insulation; glass wool-batts, blankets, rolls; acoustical ceiling panel, flexible lined sheetmetal ductwork, sheet vinyl flooring, paint and varnish removers, shellac, and photographer chemicals | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>European Union Health and Safety Executive |
| **FD&C Blue Dye #2 (Indigo carmine, indigotine)** | 482-89-3 | Hazmap: Asthmagen | Food colorant | *Food* | Hazmap (Chemicals Associated with Occupational Asthma) |
| **Fenthion** | 55-38-9 | AOEC: Asthmagen | Insecticide effective against fruit flies, leaf hoppers, cereal bugs, stem borers, mosquitoes, animal parasites, mites, aphids, codling moths, and weaver birds<br>It has been widely used in sugar cane, rice, field corn, beets, pome and stone fruit, citrus fruits, pistachio, cotton, olives, coffee, cocoa, vegetables, and vines | *Agriculture Chemical* | Association of Occupational and Environmental Clinics |
| **Fiber dust** | n/a | CHE: Asthma - Allergic Good | Fabric | *Textile* | The Collaborative on Health and the Environment (CHE) |
| **Ficus benjamina variegata (Weeping Fig)** | n/a | AOEC:Asthmagen<br>MSU: Known Sensitizer<br>Asmanet: Asthmagen | House plant | Cleaner<br>Greenhouse worker | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Flaviastase** | | CHE: Asthma - Irritant Strong<br>Asmanet: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer | Drug | *Pharmaceutical* | The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Flour** | n/a | AOEC:Asthmagen<br>EU: Known Respiratory Sensitizer<br>Asmanet: Asthmagen | Food products | Baker<br>Grain and seed handlers<br><br>*Food* | Association of Occupational and Environmental Clinics (AOEC)<br>European Union Health and Safety Executive<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Fluorine** | 7782-41-4 | AOEC:Asthmagen<br>MSU: Known Sensitizer | | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Formaldehyde** | 50-00-0 | AOEC: Asthmagen<br>CHE: Asthma - Allergic Strong<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>Asmanet: Asthmagen | Aerosol sterilization agents, acoustical mineral wool (such as wall and ceiling - sold as acoustical insulation), automobile body polish and cleaners, deodorants/air fresheners (non-personal/ non-aerosol), disinfectants (nonagricultural), floor polish, flush type doors (solid composite core, hardwood face), general performance sealants (PVAC, butyl, vinyl, etc.), Hair rinses - except color rinses, household hard surface cleaners (liquid), household liquid scouring cleaners, household rug and upholstery cleaners, industrial particleboard (furniture, fixtures, cabinets, etc.), interior solvent thinned paints, uncoated and prefinished medium density fiberboard (MDF), mineral wool: building batts, blankets and rolls, miscellaneous paint-related products, mobile home decking, non-wood upholstered office side and arm chairs, laundry aids - including ironing aids and dry cleaning spotting pretreatment, particleboard floor underlayment, prefinished hardwood plywood, rug and upholstery cleaners, scatter rugs and bathmats (rugs 6 x 9 ft and smaller), sheet vinyl flooring, softwood lumber products, softwood plywood, standard basic hardboard (not machined or coated), synthetic resin and rubber adhesives, tempered basic hardboard (not machined or coated), toilet bowl cleaners, vegetable adhesives and starch based products , wall coverings , wood office furniture, wood office secretarial chairs, and wood office work surfaces (modular systems) | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Fraxinus americana (Ashwood)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | Wood species | Carpenter<br><br>*Timber* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Freesia x hybrida (Freesia)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | Garden plant | Landscaper | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Freon [Heated]** | n/a | AOEC: Asthmagen | Used as a refrigerant, blowing agent, and propellant | Florist<br>Landscaper | Association of Occupational and Environmental Clinics (AOEC) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Frog** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | Handling of certain frog species or exposure to excreta may cause asthma | Biologist | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Fruit Fly** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>Asmanet: Asthmagen | Widely used in genetic research<br>Exposure to fruit fly infestations or their excreta may cause asthma | Biologist | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Fungal Amylase** | 9013-01-8 | AOEC: Asthmagen<br>MSU: Known Sensitizer | Used in baking products | Baker | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Fungal Amyloglucosidase** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | Used to hydrolyse starch and dextrins into sugars | n/a | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Fungal antigens** | n/a | CHE: Asthma - Allergic Strong | Mold contaiminated materials | n/a | The Collaborative on Health and the Environment (CHE) |
| **Fungal Hemicellulase** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | Mainly used in the baking to improve the quality of dough, the softness of the crumb and volume | *Food* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Furfuryl alcohol (2-furancarbinol)** | 98-00-0 | AOEC: Asthmagen<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>Asmanet: Asthmagen | Used mainly to make produce cores and molds for metal casting, raw material of all kinds of furan resin, furfuryl alcohol resin and phenol resin, tetrahydrofurfuryl alcohol, anti-corrosion coating, in some: vanishes and dyes, synthetic fabric, rubbers, pesticides and as a solvent and thinner | Foundry worker<br>Mold making<br>Wool dye house worker | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Garlic Dust** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | Food products and used as a natural insecticide | *Agriculture*<br>*Food* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Gas Metal Arc Welding on Uncoated Mild Steel** | n/a | AOEC: Asthmagen | Arc welding processes | Welder | Association of Occupational and Environmental Clinics (AOEC) |
| **Gersemia rubiformis (Red soft coral)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | Use to make jewelery | Jewelry polisher | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Glacial Acetic Acid (Acetic acid, methane carboxylic acid; ethanoic acid )** | 64-19-7 | AOEC: Asthmagen<br>NJDOH: Known Sensitizer | | *Pharmaceutical* | Association of Occupational and Environmental Clinics (AOEC)<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Glutaraldehyde** | 111-30-8 | AOEC: Asthmagen<br>EU: Known Respiratory Sensitizer<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>CHE: Asthma - Allergic Strong<br>Asmanet: Asthmagen | Agricultural chemicals, Disinfectants (nonagricultural), Furniture polish and cleaners, Laundry starch preparations | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>European Union Health and Safety Executive<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Gluten** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | Commonly found in rye, wheat, and barley; therefore, it is found in cereals and breads | *Food* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Gonystylus bancanus (Ramin)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | Wood species | Carpenter<br><br>*Timber* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Grain Dust** | n/a | AOEC: Asthmagen<br>CHE: Asthma - Allergic Strong<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers | Grain | Baker<br>Grain processor<br>Miller<br><br>*Agriculture* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE)<br>Michigan State University Occupational and Environmental Medicine<br>New Jersey Department of Health – Work Related Asthma<br>New York Department of Health – Occupational Asthmagens |
| **Guinea Pig Antigens** | n/a | AOEC: Asthmagen<br>Asmanet: Asthmagen | Kept as pets and used in biological research and a food source | Pet industry, Biological Research | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Gum Arabic (acacia gum, chaar gund, char goond, or meska)** | 1/5/9000 | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>Asmanet: Asthmagen | Used as a food stabilizer and in soft drink syrups, candies, traditional binder used in watercolor paint, in photography for gum printing, it is used as a binder in pyrotechnic compositions, shoe polish, and as an emulsifying agent | Candy maker<br>Textile worker<br><br>*Cosmetic*<br>*Explosives*<br>*Food*<br>*Gum*<br>*Pharmaceutical*<br>*Printing and lithography* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Gypsophila muralis (Baby's Breath, Soap Wort)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | Flowering Plant | Florist<br>Landscaper | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Hard Metal** | Carbides | AOEC: Asthmagen<br>CHE: Asthma - Allergic Strong<br>Asmanet: Asthmagen<br>MSU: Known Sensitizer<br>Hazmap: Asthmagen<br>NJDOH: Known Sensitizer<br>EU: Known Respiratory Sensitizer<br>NYSDOH: Asthma Triggers | A group of materials more commonly known as cemented carbides<br>They consist of mixtures of one or more of the finely divided carbides of tungsten, titanium, tantalum and vanadium embedded in a matrix of cobalt or nickel by sintering | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet)<br>Michigan State University Occupational and Environmental Medicine<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>New Jersey Department of Health – Work Related Asthma<br>European Union Health and Safety Executive<br>New York Department of Health – Occupational Asthmagens |
| **Helianthus annuus (Sunflower)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>Asmanet: Asthmagen | Food source, fresh and dried flowers | Florist<br>Landscaper<br><br>*Agriculture*<br>*Food* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Hemileuca oliviae (New Mexico range moth caterpillar, Range moth caterpiller)** | n/a | AOEC: Asthmagen | Exposure to caterpillar spines | n/a | Association of Occupational and Environmental Clinics (AOEC) |
| **Hexachlorophene** | 70-30-4 | Asthmagen (Generally accepted) | Used as a disinfectant agent and as a pesticide | Factory worker<br><br>*Agriculture* | Association of Occupational and Environmental Clinics |
| **Hexahydrophthalic anhydride** | 85-42-7 | AOEC: Asthmagen<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>CHE: Asthma - Allergic Strong<br>Asmanet: Asthmagen | Used as a hardener for epoxy resins and as intermediate for plasticizers, specialty resins, insect repellents and rust inhibitors | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Hexamethylene diisocyanate (HDI)** | 822-06-0 | AOEC: Asthmagen<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>Asmanet: Asthmagen<br>EU: Known Respiratory Sensitizer | Diisocyanates are monomers used for polyurethane production | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asmanet)<br>European Union Health and Safety Executive |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Hexamethylene tetramine (1,3,5,7- Tetraazaadamantane; Ammonioformaldehyde; Aceto HMT; Aminoform; Ammoform; Cystamin; Cystogen; Esametilentetramina (Italian); Formamine; Formin; Hexaform; Hexamethylenamine; Urotropin; Hexamethyleneamine; Hexamethylenetetraamine)** | 100-97-0 | Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>Asmanet: Asthmagen | Used as a vulcanizing agent, rubber blowing agent, in explosives, mokeless pellets; as a stabilizer for oils and synthetic resin, an additive in deodorizing powder, an anti-corrosive agent in steel, and as a disinfectant and antibacterial agent | *Multiple Industries* | Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New York State Department of Health – Occupational Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asmanet) |
| **Himic anhydride (anhydride; Bicyclo[2.2.1]hept-5-ene-2,3-dicarboxylic anhydride; 5-Norbornene-2,3-dicarboxylic anhydride)** | 826-62-0 | EU: Known Respiratory Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>CHE: Asthma - Allergic Strong<br>Asmanet: Asthmagen | Used in the manufacturing of flame retardants, adhesives, and epoxy resins | Epoxy resin factory worker<br>Pharmaceutical<br>Flame retardant<br>Plastics/ rubber worker<br><br>*Adhesive*<br>*Chemical*<br>*Dye* | European Union Health and Safety Executive<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asmanet) |
| **Honeybee (Apis mellifica)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>Asmanet: Asthmagen | Bees, bee stings and bee products | Beekeeper | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Table of Agents and Substances that cause Occupational Asthma (Asmanet) |
| **Humulus lupulus (Hops)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | Beer | *Brewery* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Hydralazine (Phthalazine,1-hydrazinyl-)** | 86-54-4 | AOEC: Asthmagen<br>CHE: Asthma - Irritant Good<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | Drug - muscle relaxant | *Pharmaceutical* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Hydrochloric Acid Aerosols** | 7647-01-0 | AOEC: Asthmagen<br>Asmanet: Asthmagen | The acid has numeous uses from which aerosols may be emitted | Cement kiln worker<br>Foundry worker<br>Janitorial worker<br>Paper and pulp workers<br>Textile mill worker<br>Tobacco factory worker<br><br>*Food*<br>*Timber*<br>*Plastics* | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Hydrogen Sulfide (Hydrosulfuric acid; hydrogen sulphide, sewer gas, stink damp; sulfur hydride; sulfurated hydrogen; dihydrogen monosulfide; dihydrogen sulfide, sulfuretted hydrogen, hepatic acid, sour gas)** | 7783-06-04 | CHE: Asthma - Irritant Strong | Hydrogen sulfide has few important commercial uses<br>Exposure to the gas may occur in sewers and other areas where the gas is emitted | Plumber<br>Sewer Treatment | The Collaborative on Health and the Environment (CHE) |
| **Insect antigens** | n/a | CHE: Asthma - Allergic Strong<br>Asmanet: Asthmagen | | *Multiple Industries* | The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Ipecac syrup (Ipecac ; ipecacuanha, syrup of ipecac)** | 8012-96-2 | AOEC: Asthmagen<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | An emetic for use in cases of accidental poisoning | Pharmaceutical | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Isocyanates** | 1125 | EU: Known Respiratory Sensitizer<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>CHE: Asthma - Irritant Strong<br>Asmanet: Asthmagen | Preserved wood, surface coatings, resin and rubber adhesives, carpet adhesive solvents, particleboard, polish, cleaners, sealants, solvents for paper coating, wood wtains and varnishes, printing solvents for flexography and gravure printing, tufted carpets and rugs, particleboard, wood furniture, vinyl coated wallpaper, all purpose cleaner (aerosol), household laundry starch preparations, degreasers, adhesive removers, auto body polish and cleaners, furniture polish and cleaners, leather/Suede dressings and finishes, solvent thinned exterior under coaters, solvent thinned exterior stains, alkyd semi-gloss paint, alkyd primer, polyurethane liquid plastic, solvent thinned interior clear finishes, solvent thinned interior stains, aerosol paint concentrates (spray: enamels, lacquers, finishes, epoxy, paint, primer, flame proof coating, varnish), paint and varnish removers, thinners for dopes (lacquers, and oleo, putty, glazing), synthetic resin and rubber adhesives (general purpose adhesive and contact cement), polyvinyl acetate (latex type) adhesive, adhesive films - all types including pressure, urethane adhesives, general performance sealants, styrene-butadiene rubber sealant, gravure inks (furniture laminates, paneling, food packaging, wall paper, magazines, greeting cards), packaging inks: solvent types, aerosol concentrate (resin), lubricating and similar oils (silicone), loose fiber (blowing and pouring) fireproofing, and sheet vinyl flooring | *Multiple Industries* | European Union Health and Safety Executive<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Isofenphos (Pyrfon)** | 25311-71-1 | AOEC: Asthmagen<br>CHE: Asthma - Irritant Good | Insecticides | *Agriculture Chemical* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE) |
| **Isoniazid (Laniazid, nydrazid), isonicotinylhydrazine, NH)** | 54-85-3 | Hazmap: Asthmagen<br>NJDOH: Known Sensitizer<br>AOEC: Asthmagen (Sensitizer ) | An antibacterial compound used in the treatment of tuberculosis | *Health Care Pharmaceutical* | Hazmap (Chemicals Associated with Occupational Asthma)<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>Association of Occupational and Environmental Clinics (AOEC) |
| **Iso-nonanoyl oxybenzene sulfonate (SINOS, isononanoyl oxybenzene sulfonate)** | 123354-92-7 | Hazmap: Asthmagen | Used in a detergent products | Detergent factory worker<br>Laboratory worker | Hazmap (Chemicals Associated with Occupational Asthma) |
| **Isophorone diisocyanate (Monomeric cycloaliphatic diisocyanate or 3-isocyanatomethyl-3,5,5-trimethylcyclohexylisocyanate, IPDI)** | 4098-71-9 | AOEC: Asthmagen<br>Hazmap: Asthmagen<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>CHE: Asthma - Irritant Strong<br>Asmanet: Asthmagen<br>EU: Known Respiratory Sensitizer | Used in enamel coatings that are resistant to abrasion and degradation from ultraviolet light | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet)<br>European Union Health and Safety Executive |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Juglans olanchana (Central American Walnut)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | Wood species | Carpenter<br><br>*Timber* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Alphitobius diaperinus (Lesser Mealworm)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | n/a | Grain and poultry workers | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **L. caesar larva (common greenbottle)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | n/a | n/a | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthm |
| **Lactoserum (Whey)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer | Cheese | *Dairy* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens |
| **Lanasol Yellow 4G (C.I. Reactive Yellow 39; Lanasol Yellow 4G; disodium 4-[4-[5-(2-bromoprop-2-enoylamino)-2-sulfonato-phenyl] azo-3-methyl-5-oxo-4H-pyrazol-1-yl]-2,5-dichloro-benzenesulfonate)** | 70247-70-0 | AOEC: Asthmagen | Textile dye | *Dye* | Association of Occupational and Environmental Clinics (AOEC) |
| **Latex** | 98-82-8 | AOEC: Asthmagen<br>CHE: Asthma - Allergic Strong<br>MSU: Known Sensitizer<br>Asmanet: Asthmagen<br>NJDOH: Known Sensitizer<br>EU: Known Respiratory Sensitizer | Natural rubber, rubber gloves, and vegetable Gums | Condom factory worker<br>Daycare provider<br>Janitorial worker<br>Laboratory worker<br>Surgical, rubber, and natural rubber glove factory workers<br><br>*Dentistry*<br>*Food*<br>*Healthcare*<br>*Textile*<br>*Vegetable gums* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE)<br>Michigan State University Occupational and Environmental Medicine<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet)<br>New Jersey Department of Health – Work Related Asthma<br>European Union Health and Safety Executive |
| **Lathyrus sativus (grass pea, blue sweet pea, chickling vetch, Indian pea, Indian vetch, white vetch, almorta )** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>Asmanet: Asthmagen | A legume commonly grown for human consumption and livestock feed; also used in dry flower displays | Florist<br>Food preparation<br><br>*Agriculture* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Lawsonia inermis (Henna, mignonette tree)** | 83-72-7 | AOEC: Asthmagen<br>EU: Known Respiratory Sensitizer<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | Used as a dye for body art, leather, and fabrics | Fabric dyer<br>Natural tattoo artist<br><br>*Tanning* | Association of Occupational and Environmental Clinics (AOEC)<br>European Union Health and Safety Executive<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Leptinotarsa decemlineata (Colorado potato beetle)** | n/a | AOEC: Asthmagen | n/a | *Agriculture* | Association of Occupational and Environmental Clinics (AOEC) |
| **Levafix Brilliant Yellow E36** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer | Dye | *Dye* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens |
| **Limonium tataricum (Woodcreek)** | n/a | AOEC: Asthmagen<br>Asmanet: Asthmagen | Pollens, house plants, and dried flowers | Florist<br>Landscaper | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Linum usitatissimum (Linseed) oilcake** | n/a | AOEC: Asthmagen<br>Asmanet: Asthmagen | Linseed oil cake is the residue remaining after expression of the oil from the seeds | Herbalist<br>Research chemist | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Locust (insect)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>Asmanet: Asthmagen | Insect infestations | Biologist<br><br>*Agriculture* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New York State Department of Health – Occupational Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Lycopodium Powder** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | Products made from dried moss and fern spores<br>Commonly found in cosmetics, explosives, and condoms | *Cosmetic*<br>*Explosives*<br>*Pharmaceutical* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Malathion** | 121-75-5 | AOEC: Asthmagen<br>CHE: Asthma - Irritant Good<br>Asmanet: Asthmagen | Used in public health pest control programs such as mosquito eradication | Landscaper<br><br>*Agriculture* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Maleic anhydride (cis-butenedioic anhydride, toxilic anhydride, 2,5 dioxofuran)** | 108-31-6 | AOEC: Asthmagen<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>CHE: Asthma - Allergic Strong<br>Asmanet: Asthmagen | Paint, foam molding, adhesives, surface coatings, Agriboard, manufacture polyester resins, and epoxy resins | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Metal fumes** | n/a | CHE: Asthma - Allergic Strong | Processes involving heating of metals | Foundry worker<br>Metal shop worker<br>Welder | The Collaborative on Health and the Environment (CHE) |
| **Methacrylate** | n/a | NYSDOH: Asthma Triggers<br>CHE: Asthma - Allergic Strong | Adhesives | *Multiple Industries* | New York State Department of Health – Occupational Asthmagens<br>The Collaborative on Health and the Environment (CHE) |
| **Methyl 2-cyanoacrylate (Mecrylate, Methyl cyanoacrylate, Methyl □-cyanoacrylate, Methyl ester of 2-cyanoacrylic acid)** | 137-05-3 | Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NYSDOH: Asthma Triggers | Synthetic resin and rubber adhesives | *Multiple Industries* | Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New York State Department of Health – Occupational Asthmagens |
| **1,1'-Methylenebis (4Isocyanatobenzene, Methylene Diisocyanate)** | 101-68-8 | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>CHE: Asthma - Irritant Good<br>Asmanet: Asthmagen | Resin and rubber adhesives, sealants, softeners (plastcizers - phthalates), water-based general purpose adhesives, interior water thinned coatings, and general performance sealants (vinyl acrylic emulsion sealants) | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Collaborative on Health and the Environment (CHE)<br>European Union Health and Safety Executive |
| **Methyl Blue (Cotton blue, Helvetia blue, Acid blue 93)** | 28983-56-4 | AOEC: Asthmagen | Used as a stain in histology | Laboratory worker | Association of Occupational and Environmental Clinics (AOEC) |
| **Methyl methacrylate (MMA, 2-(methoxycarbonyl)-1-propene)** | 80-62-6 | AOEC: Asthmagen<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>Asmanet: Asthmagen | Used in pharmaceutical preparations, synthetic resin and rubber adhesives and plastic rigid sheet products | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Methyl tetrahydrophthalic anhydride** | 19438-64-3 | AOEC: Asthmagen<br>EU: Known Respiratory Sensitizer<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>CHE: Asthma - Allergic Strong | Curing agents | Plastics/ rubber worker<br><br>*Adhesive*<br>*Chemical*<br>*Dye*<br>*Pharmaceutical*<br>*Polyester resin* | Association of Occupational and Environmental Clinics (AOEC)<br>European Union Health and Safety Executive<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Collaborative on Health and the Environment (CHE) |
| **Methylchloro-isothiazolinone (Methylchloroisothiazolinone)** | 26172-55-4 | Hazmap: Asthmagen | Used in water-based personal care products and cosmetics | *Chemical* | Hazmap (Chemicals Associated with Occupational Asthma) |
| **Methyldopa (L-□-Methyl-3,4-dihydroxyphenylalanine; Aldomet, Aldoril, Dopamet, Dopegyt)** | 555-30-6 | AOEC: Asthmagen<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers | Pharmaceutical - psychoactive drug | *Pharmaceutical* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens |
| **Methylene-bis(4-cyclohexylisocyanate) (HMDI, Dicyclohexylmethane 4,4-diisocyanate (Hydrogenated MDI)** | 5124-30-1 | Hazmap: Asthmagen<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>CHE: Asthma - Irritant Strong<br>EU: Known Respiratory Sensitizer | HMDI is used primarily to produce urethane products that will not yellow when exposed to light | *Multiple Industries* | Hazmap (Chemicals Associated with Occupational Asthma)<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Collaborative on Health and the Environment (CHE)<br>European Union Health and Safety Executive |
| **3-Methylmorphine (Codeine)** | 76-57-3 | EU: Known Respiratory Sensitizer<br>Hazmap: Asthmagen | Pharmaceutical | *Pharmaceutical* | European Union Health and Safety Executive<br>Hazmap (Chemicals Associated with Occupational Asthma |
| **4-Methylmorpholine** | 109-02-4 | AOEC: Asthmagen<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers | Used as a solvent for chemical reactions | *Chemical* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens |
| **Mice** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>Asmanet: Asthmagen | Pest infestations, vivaria | Animal handler<br>Laboratory technician | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Table of Agents and Substances that cause Occupational Asthma (Asmanet) |
| **Microberlinia (African Zebrawood)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | Wood species | Carpenter<br><br>*Timber* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Mineral Oil (white oil, liquid paraffin, liquid petroleum) Mist** | n/a | Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers | An oil used in metalworking and machining for lubrication and cutting | Machinist<br>Tool setter<br><br>*Auto industry* | Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens |
| **Mites, NOS** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>Asmanet: Asthmagen<br>EU: Known Respiratory Sensitizer | | Flour handler<br>Winery worker<br><br>*Agriculture*<br>*Food* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet)<br>European Union Health and Safety Executive |
| **Mitoxantrone** | 65271-80-9 | Hazmap: Asthmagen | Pharmaceutical - anti-cancer drug | *Pharmaceutical* | Hazmap (Chemicals Associated with Occupational Asthma) |
| **Monascus ruber** | n/a | Hazmap: Asthmagen<br>Asmanet: Asthmagen | Food colorant | *Cosmetic*<br>*Dye*<br>*Food*<br>*Pharmaceutical*<br>*Textile* | Hazmap (Chemicals Associated with Occupational Asthma)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Morphine (Nrms; hocus; morph; morpho; msemma; dreamer; morfina; morphia; morphin; roxanol)** | 57-27-2 | AOEC: Asthmagen<br>Hazmap: Asthmagen | Morphine is an natural alkaloid that is from the resin of Papaver somniferum's (Opium) poppy | *Healthcare*<br>*Pharmaceutical* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma) |
| **Myroxylon balsamum (Cabreuva/ Santos Mahogany)** | n/a | AOEC: Asthmagen | Wood species that is used in perfumes | Carpenter<br><br>*Timber*<br>*Perfume* | Association of Occupational and Environmental Clinics (AOEC) |
| **Nacre (Mother of Pearl) dust** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | Used to decorate architectural elements and watches, knives, guns and jewelry | Gunsmith<br>Jeweler<br>Metalworker | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Naphthalene Diisocyanate ( Naphthylene Diisocyante (NDI), Naphthylene Diisocyanate)** | 25551-28-4 | AOEC: Asthmagen<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>CHE: Asthma - Allergic strong<br>Asmanet: Asthmagen<br>EU: Known Respiratory Sensitizer | Rubber products | Auto body repairer<br>Automobile painter<br>Boat builder<br>Foundry worker<br>Paint sprayer<br>Plastics<br>Polyurethane foam sprayer<br>Polyurethane installer<br>Plastic/ rubber worker<br><br>*Adhesive*<br>*Carpenter*<br>*Chemical*<br>*Dentistry*<br>*Rubber*<br>*Metallurgy* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet)<br>European Union Health and Safety Executive |
| **Nesorgordonia papverifera (Kotibe)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>Asmanet: Asthmagen | Wood species | Carpenter<br><br>*Timber* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Neurospora** | n/a | AOEC: Asthmagen | Bread mold, also used in biological research | biologist<br><br>*Food* | Association of Occupational and Environmental Clinics (AOEC) |
| **Nickel** | 7440-02-0 | AOEC: Asthmagen<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>CHE: Asthma - Allergic strong<br>Asmanet: Asthmagen | Nickel is commonly used in the form of alloys: nickel silver, monel metal, and stainless steel<br>Nickel silver finish is used on hardware and plumbing fixtures<br>Stainless steel's resistance to corrosion and staining means it is ideal material for toilet partitions, shelving, hardware, special frames and doors, appliances; kitchen, lab, and medical equipment | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Nickel Compounds** | NDB000 | AOEC: Asthmagen<br>Hazmap: Asthmagen | | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma) |
| **Nicotiana tabacum (Tobacco) Leaf** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer | Cigars, cigarettes, and chewing tobacco | *Tobacco* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Ninhydrin (ninhydrin monohydrate, 1,2,3-triketohydrindene monohydrate, 1,2,3-indantrione monohydrate, 2,2-dihydroxy-1,3-indandione, 1H-indene-1,2,3-trione monohydrate, triketohydrindene hydrate)** | 485-47-2 | Hazmap: Asthmagen<br>NJDOH: Known Sensitizer | Used to detect fingerprints and as a chemical reagent | Laboratory worker<br>Forensics | Hazmap (Chemicals Associated with Occupational Asthma)<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens |
| **Nitrogen Dioxide (N02)** | 10102-44-0 | CHE: Asthma - Irritant strong | Used in the manufacturing of pharmaceuticals, paper and pulp products and as solvent for cleaning in printing; it is also in laboratory chemicals (solvents - dilution), herbicides and insecticides, wood stains and varnish solvents, sealants, tufted carpets and rugs, household laundry starch preparations, lubricating and similar oils, and general performance sealants Nitrogen Dioxide is also produced by the combustion processes, such as unvented combustion in residential appliances | Factory worker<br>Laboratory worker<br>Laundry worker<br><br>*Chemical*<br>*Pharmaceutical* | The Collaborative on Health and the Environment (CHE) |
| **Nitrogen Trichoride (Trichloramine)** | 10025-85-1 | Hazmap: Asthmagen | Used to artificially bleach and age flour<br>It is also a byproduct of the chemical reactions between ammonia-derivatives and chlorine; i.e. in swimming pools between disinfecting chlorine and urea in urine from swimmers | Lifeguard<br>Swimming Pool Cleaner<br><br>*Food* | Hazmap (Chemicals Associated with Occupational Asthma) |
| **Oil fly ash (Residual oil fly ash, ROFA)** | n/a | CHE: Asthma - Irritant Good | Fly ash is a by-product of burning oil | Boiler/ Furnace maintenance worker | The Collaborative on Health and the Environment (CHE) |
| **Organophosphate (OP)** | | CHE: Asthma - Irritant Good | Used in insecticides, herbicides, and nerve gases | *Agriculture*<br>*Chemical*<br>*Landscape* | The Collaborative on Health and the Environment (CHE) |
| **Ornithonyssus bursae (Northern Fowl Mites)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | Pest of domestic fowl and wild birds | Poultry industry workers | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Osmium oxide (OsO4, osmium tetraoxide, Osmium(IV) oxide, Osmiumtetraoxid)** | 20816-12-0 | CHE: Asthma - Irritant Good | Used in biomedical research as a staining agent | Laboratory worker | The Collaborative on Health and the Environment (CHE) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Ostrinia nubilalis (European corn borer)** | n/a | AOEC: Asthmagen | These caterpillars damage the ears of corn | Grain handlers<br>*Agriculture* | Association of Occupational and Environmental Clinics (AOEC) |
| **Ozone (O3, trioxygen)** | 10028-15-6 | CHE: Asthma - Irritant Good | An unstable form of oxygen that exists in the atmosphere<br>It is used as a disinfectant and in industrial purification processes such as water treatment | Gas handler<br>Laboratory worker<br>*Chemical*<br>*Healthcare* | The Collaborative on Health and the Environment (CHE) |
| **Palaquium (Gutta-percha)** | n/a | AOEC: Asthmagen | Gutta-percha is a genus of trees that yields a sap used to natural latex product used in polyterpene, a polymer of isoprene, or polyisoprene, specifically (trans-1,4-polyisoprene); and used for temporary fillings | Dentistry<br>Factory worker | Association of Occupational and Environmental Clinics (AOEC) |
| **Palladium (Pd)** | 7440-05-3 | Hazmap: Asthmagen<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | Used in catalytic converters, jewelry, dentistry, watch making, blood sugar test strips, aircraft spark plugs, surgical instruments and electrical contacts such as circuit boards | Circuit board factory worker<br>*Auto*<br>*Aircraft*<br>*Jewelry* | Hazmap (Chemicals Associated with Occupational Asthma)<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Pancreatin** | 8049-47-6 | AOEC: Asthmagen | Pharmaceutical - disorders of the pancreas | *Pharmaceutical* | Association of Occupational and Environmental Clinics (AOEC) |
| **Papain (Papaya proteinase I)** | 9001-73-4 | AOEC: Asthmagen - Generally Accepted<br>EU: Known Respiratory Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>CHE: Asthma - Allergic Strong<br>Asmanet: Asthmagen | A component of powdered meat tenderizer and also used in breath mints, toothpaste, teeth whiters | Dentistry<br>*Food* | Association of Occupational and Environmental Clinics (AOEC)<br>European Union Health and Safety Executive<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Paraformaldehyde (polyoxymethylene; metaformaldehyde, paraform, formagene)** | 30525-89-4 | AOEC: Asthmagen - Generally Accepted<br>Hazmap: Asthmagen<br>CHE: Asthma - Allergic Strong<br>Asmanet: Asthmagen | Used as fumigant, disinfectant, fungicide, and fixative, and in the process of making pure formaldehyde | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Parathion (parathion-ethyl, diethyl parathion)** | 56-38-2 | AOEC: Asthmagen<br>Asmanet: Asthmagen | Insecticide | Exterminator<br>*Agriculture* | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Pectin** | 9000-69-5 | Asmanet: Asthmagen | Used as a gelling agent, thickening agent and stabilizer in food | *Food* | The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Penicillamine** | 52-67-5 | AOEC: Asthmagen<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer | Pharmaceutical - rheumatoid arthritis | *Pharmaceutical* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>Hazmap (Chemicals Associated with Occupational Asthma) |
| **Penicillin (Ampillin)** | 69-53-4 | AOEC: Asthmagen<br>EU: Known Respiratory Sensitizer<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>Asmanet: Asthmagen<br>Hazmap: Asthmagen | Pharmaceutical - Antibiotics | Livestock/ animal handler<br>*Healthcare*<br>*Pharmaceutical*<br>*Veterinary Medicine* | Association of Occupational and Environmental Clinics (AOEC)<br>European Union Health and Safety Executive<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet)<br>Hazmap (Chemicals Associated with Occupational Asthma) |
| **Penicillium** | n/a | AOEC: Asthmagen<br>Asmanet: Asthmagen | Used to make Penicillin (Ampillin)<br>Mold contaminant in the indoor environment | *Pharmaceutical* | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Pepsin** | 9001-75-6 | AOEC: Asthmagen - Generally Accepted<br>MSU: Known Sensitizer<br>CHE: Asthma - Allergic Strong<br>Asmanet: Asthmagen | Pharmaceutical - digestive aid | Livestock/ animal handler<br>*Healthcare*<br>*Pharmaceutical*<br>*Veterinary Medicine* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Peroxyacetic Acid (PAA, peroxyacetic acid, acetic peroxide, acetyl hydroperoxide)** | 79-21-0 | AOEC: Asthmagen | Used as a bleaching agent, antimicrobial agent, and fowl sanitizer | Janitorial worker<br>Poultry worker<br>Pulp factory worker | Association of Occupational and Environmental Clinics (AOEC) |
| **Persulfate Salts - a group of substances that includes: Ammonium persulfate, Potasium persulfate, and Sodium persulfate** | 7727-54-0, 7727-21-1, 7775-27-1 | AOEC: Asthmagen<br>NYSDOH: Asthma Triggers | Used in polymerization reactions and for printed circuit manufacturing; also are used as oxidants in hair bleaching products | Hairdresser<br>Printed circuit factory worker<br>*Chemical* | Association of Occupational and Environmental Clinics (AOEC)<br>New York Department of Health – Occupational Asthmagens |
| **Pfaffia paniculata (Brazil Ginseng)** | n/a | AOEC: Asthmagen<br>Asmanet: Asthmagen | A ground vine used in herbal medicine | Herbalist | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Phaseolus vulgaris (Green Beans)** | n/a | AOEC: Asthmagen | Food products | *Food* | Association of Occupational and Environmental Clinics (AOEC) |
| **Phenols** | Organic compounds | CHE: Asthma - Allergic Good | Used in laboratory processes and as a raw material for chemical, pharmaceutical, and plastic manufacturing | Laboratory worker<br>*Chemical*<br>*Plastic*<br>*Pharmaceutical* | The Collaborative on Health and the Environment (CHE) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Phenylenediamine (PPD, p-Diamino benzene; 1,4-Diaminobenzene; p-Phenylenediamine; p-Diaminobenzene)** | 106-50-3 | Hazmap: Asthmagen<br>NYSDOH: Asthma Triggers<br>CHE: Asthma - Allergic Strong | Used in dyes (for hair), developing agents, some rubber products and is also a precursor element in the production of aramid type plastics | *Multiple Industries* | Hazmap (Chemicals Associated with Occupational Asthma)<br>New York State Department of Health – Occupational Asthmagens<br>The Collaborative on Health and the Environment (CHE) |
| **2-Phenylphenol (o-phenylphenol, biphenylol 2-hydroxybiphenyl, orthophenyl phenol)** | 90-43-7 | AOEC: Asthmagen<br>CHE: Asthma - Irritant Good | Used as agricultural fungicide and surface disinfectant; it is also used as a food additive (E231) | *Agriculture*<br>*Chemical*<br>*Food*<br>*Healthcare* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE) |
| **Phosgene (CG; carbon dichloride oxide; carbon oxychloride; chloroformyl chloride; dichloroformaldehyde; dichloromethanone)** | 75-44-5 | CHE: Asthma - Irritant Good | Mostly used in the production of isocyanates | *Chemical* | The Collaborative on Health and the Environment (CHE) |
| **Phthalates** | Multiple CAS numbers | CHE: Asthma - Irritant Limited | A plasticizer used mostly in the production of flexible PVC products<br>A class of phthalates that includes but not limited to Butyl Benzyl Phthalate (BBP), Di(2-Ethylhexyl) Phthalate (DEHP), Di-N-Octyl Phthalate (DNOP), Di-N-Pentyl Phthalate (DNPP), Dibutyl Phthalate (DBP), Diisobutyl Phthalate (DIBP), Diisodecyl Phthalate (DIDP), Diisononyl Phthalate (DINP), Di-N-Hexylphthalate (DNHP) Commonly used a in a large variety of products: enteric coatings of pharmaceutical pills and nutritional supplements, viscosity control agents, gelling agents, film formers, stabilizers, dispersants, lubricants, binders, emulsifying agents, and suspending agents, adhesives and glues, agricultural adjuvants, building materials, personal-care products, medical devices, detergents and surfactants, packaging, children's toys, modelling clay, waxes, paints, printing inks and coatings, pharmaceuticals, food products, and textiles, soft plastic fishing lures, caulk, paint pigments, sex toys, shower curtains, vinyl upholstery, adhesives, floor tiles, food containers and wrappers, cleaning materials, personal-care items containing phthalates include perfume, eye shadow, moisturizer, nail polish, liquid soap, and hair spray, medical devices, electronic equipment, perfumes and pesticides | *Multiple Industries* | The Collaborative on Health and the Environment (CHE) |
| **Phthalic anhydride (PA, 1,2 Benzenedicarboxylic acid anhydride, 1,3-Isobenzofurandione, 1,3Dixophthalan, Anhidrido ftalico, Phthalic acid anhydride)** | 85-44-9 | Hazmap: Asthmagen<br>AOEC: Asthmagen<br>CHE: Asthma - Allergic Strong | Used to create plasticizers for plastics and in some dyes | *Multiple Industries* | Inhalation Hazard Chemicals (U.S. Dept. of Transportation)<br>Hazmap (Chemicals Associated with Occupational Asthma<br>Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE) |
| **Pig** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | to pig dander or excreta | *Agriculture* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Pinellia Ternata (Crow dipper)** | n/a | AOEC: Asthmagen | An invasive weed from China | Landscaper | Association of Occupational and Environmental Clinics (AOEC) |
| **Piperazine dihydrochloride (diethylenediaminedihydrochloride, dihydrochloridesaltofdiethylenediamine, dihydropipwormer, dowzenedhc, piperazinehydrochloride, piperazinewormerpremix)** | 142-64-3 | AOEC: Asthmagen<br>EU: Known Respiratory Sensitizer<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>CHE: Asthma - Allergic Strong<br>Asmanet: Asthmagen | Used in insecticides and some pharmaceuticals | Livestock/ animal handler<br>*Agriculture*<br>*Pharmaceutical*<br>*Veterinary Medicine* | Association of Occupational and Environmental Clinics (AOEC)<br>European Union Health and Safety Executive<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma |
| **Plant pollens** | n/a | CHE: Asthma - Allergic Strong<br>Asmanet: Asthmagen | n/a | Florist<br>Landscaper<br>*Agriculture* | The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Plastic dusts** | n/a | CHE: Asthma - Allergic Strong<br>Asmanet: Asthmagen | n/a | *Chemical*<br>*Plastics* | The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Plastic fumes** | n/a | CHE: Asthma - Allergic Strong<br>Asmanet: Asthmagen | n/a | *Chemical*<br>*Plastics* | The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Platinum (Pt)** | 7440-06-4 | Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>CHE: Asthma - Allergic Strong<br>Asmanet: Asthmagen | Used in catalytic converters, laboratory equipment, electrical contacts and electrodes, platinum resistance thermometers, dentistry equipment, and jewelry | Platinum refinery worker<br>*Chemical*<br>*Jewelry*<br>*Metallurgy* | Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma |
| **Plutonium-239 and its decay products, which may contain Plutonium-240** | 15117-48-3 | AOEC: Asthmagen | An isotope found in spent nuclear fuels and used for the production of nuclear weapons | Weapons factory worker<br>Nuclear fuel reprocessing | Association of Occupational and Environmental Clinics (AOEC) |
| **Polyfunctional aziridine (Trimethylolpropane tris(2-methyl-1-aziridine propionate))** | 64265-57-2 | AOEC: Asthmagen | Used in coatings and adhesives | Cabinetmakers | Association of Occupational and Environmental Clinics (AOEC) |
| **Polygonum fagopyrum (Buckwheat)** | n/a | AOEC: Asthmagen - Generally Accepted<br>MSU: Known Sensitizer<br>Asmanet: Asthmagen | Grain | Bakers<br>Millers<br>*Food* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Polymethylene Polyphenyl isocyanate (PAPI)** | 9016-87-9 | AOEC: Asthmagen<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>CHE: Asthma - Irritant Strong<br>EU: Known Respiratory Sensitizer | Used in the manufacturing of polyurethane foams, coatings and elastomers | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Collaborative on Health and the Environment (CHE)<br>European Union Health and Safety Executive |
| **Polypropylene - Heated** | 9003-07-0 | Hazmap: Asthmagen<br>CHE: Asthma - Allergic Strong<br>NJDOH: Known Sensitizer | Used in a many applications: packaging, textiles (e.g. ropes, thermal underwear and carpets), stationery, plastic parts and reusable containers, piping/ tubing, laboratory equipment, loudspeakers, automotive components, and polymer based banknotes | Bag factory worker<br>Paper wrapper<br>Plumber<br>*Plastics* | Hazmap (Chemicals Associated with Occupational Asthma)<br>The Collaborative on Health and the Environment (CHE)<br>New Jersey Department of Health – Work Related Asthma |
| **Polypropylene Glycol ( 1,2-Epoxypropane Polymer, 1,2-Propanediol, Homopolymer, 1,2-Propylene Glycol-Propylene Oxide Polymer, 1-Propanol, 2-(2-hydroxypropoxy), 2-(2 HYDROXYPROPOXY)-1-PROPANOL, 2-(2-Hydroxypropoxy))** | 25322-69-4 | AOEC: Asthmagen | Used in many formulations for polyurethanes; as surfactant, wetting agent, dispersant in leather finishing, and to sterilize or pasteurize nutmeats, notably almonds, and as thickener | Factory worker<br>Leatherworker<br>*Food*<br>*Chemical* | Association of Occupational and Environmental Clinics (AOEC) |
| **Polyvinyl Chloride (PVC) - Dust or heated and thermal decomposition products** | 9002-86-2 | AOEC: Asthmagen<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>CHE: Asthma - Allergic Strong<br>Asmanet: Asthmagen | Emission products from manufacturing plastics and heat sealing packaging | Butchers<br>Manufacturing | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Pouteria (Abiruana)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>Asmanet: Asthmagen | Wood species | Furniture maker<br>*Timber* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Prawn** | n/a | AOEC: Asthmagen - Generally Accepted<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | Seafood | *Food* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma |
| **Propetamphos (Safrotin)** | 31218-83-4 | AOEC: Asthmagen<br>CHE: Asthma - Irritant Good | Pesticide - General purpose | Exterminator | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Propionaldehyde (Methylacetaldehyde; propionic aldehyde, propaldehyde)** | 123-38-6 | CHE: Asthma - Allergic Good | Used as a precursor chemical in making alkyd resins | *Chemical* | The Collaborative on Health and the Environment (CHE) |
| **Psyllium (Ispaghula)** | n/a | MSU: Known Sensitizer<br>AOEC: Asthmagen<br>NYSDOH: Asthma Triggers<br>Asmanet: Asthmagen<br>EU: Known Respiratory Sensitizer<br>NJDOH: Known Sensitizer<br>Hazmap: Asthmagen | Used as a dietary fiber in pharmaceuticals | Nurse<br>*Agriculture*<br>*Pharmaceutical* | Michigan State University Occupational and Environmental Medicine<br>Association of Occupational and Environmental Clinics (AOEC)<br>New York Department of Health – Occupational Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet)<br>European Union Health and Safety Executive<br>New Jersey Department of Health – Work Related Asthma<br>Hazmap (Chemicals Associated with Occupational Asthma) |
| **Pterocarpus angolensis (Kejaat)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | Wood species | Carpenter<br>*Timber* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Pyrethins and Pyrethroids** | 8003-34-7 | AOEC: Asthmagen<br>CHE: Asthma - Irritant Good | Insecticides | *Agriculture*<br>*Chemical* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE) |
| **Pyromellitic dianhydride (PMDA; 1,2,4,5-Benzenetetracarboxylic Dianhydride)** | 89-32-7 | AOEC: Asthmagen<br>Hazmap: Asthmagen<br>CHE: Asthma -Allergic Strong | Used as a curing agent for epoxy, in adhesives and coating material manufacturing and as a raw material of engineering plastics (polyimides) | Polyimide factory worker<br>*Adhesive*<br>*Chemical* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>The Collaborative on Health and the Environment (CHE) |
| **Quercus robur (Oak)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>Asmanet: Asthmagen | Wood species | Carpenter | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Quillaja saponaria (Soap Bark Tree)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | Wood species that is used in perfumes | *Timber*<br>*Perfume* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Rabbit Antigens** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>Asmanet: Asthmagen<br>NYSDOH: Asthma Triggers | | Laboratory worker | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet)<br>New York State Department of Health – Occupational Asthmagens |
| **Radiographic Fixative** | n/a | AOEC: Asthmagen | Hardener in x-ray image developing | X-Ray Technician | Association of Occupational and Environmental Clinics (AOEC) |
| **Rat Antigens** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>Asmanet: Asthmagen | | Laboratory worker | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New York State Department of Health – Occupational Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Reactive Dyes** | n/a | AOEC: Asthmagen<br>CHE: Asthma - Allergic Good<br>MSU: Known Sensitizer<br>EU: Known Respiratory Sensitizer | Used extensively in food, clothing, paints, and plastics manufacturing | *Dye*<br>*Food*<br>*Plastics* | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE)<br>Michigan State University Occupational and Environmental Medicine<br>European Union Health and Safety Executive |
| **Rhodium** | 7440-16-6 | AOEC: Asthmagen | Used in automobiles as a catalytic converter material, jewelry, electrical contact, nuclear reactors, and as a filter in mammography | Solderer<br>X-Ray Technician<br>*Automobile* | Association of Occupational and Environmental Clinics (AOEC) |
| **Rice Dust** | n/a | AOEC: Asthmagen | Rice farming and processing | Grain handler | Association of Occupational and Environmental Clinics (AOEC) |
| **Ricinus communis (Castor Bean)** | n/a | AOEC: Asthmagen<br>EU: Known Respiratory Sensitizer<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | A flowering tree used as an ornamental and for production of castor oil from its seeds | Millers<br>Stevedores<br>*Agriculture*<br>*Petrochemical* | Association of Occupational and Environmental Clinics (AOEC)<br>European Union Health and Safety Executive<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Rifacion Orange HE 2G** | n/a | AOEC: Asthmagen | Dye | *Dye* | Association of Occupational and Environmental Clinics (AOEC) |
| **Rifafix Yellow 3 RN** | n/a | AOEC: Asthmagen | Dye | *Dye* | Association of Occupational and Environmental Clinics (AOEC) |
| **Rifazol Black GR** | n/a | AOEC: Asthmagen | Dye | *Dye* | Association of Occupational and Environmental Clinics (AOEC) |
| **Rifazol Brilliant Orange 3R** | n/a | AOEC: Asthmagen | Dye | *Dye* | Association of Occupational and Environmental Clinics (AOEC) |
| **Rose Hips (Rose haw)** | n/a | AOEC: Asthmagen<br>NJDOH: Known Sensitizer | Rose hip is the fruit of a rose plant and is used in herbal tea, jam, jelly, syrup, soup, beverages, pies, bread, wine, and marmalade; horse feed, and for medical purposes | Gardener<br>Horse Handler<br>*Food*<br>*Pharmaceutical* | Association of Occupational and Environmental Clinics (AOEC)<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens |
| **Rye Flour** | n/a | AOEC: Asthmagen - Generally Accepted<br>MSU: Known Sensitizer<br>Asmanet: Asthmagen | Bread | Baker<br>Miller | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Salbutamol Intermediate (5-Acetyl Methyle Salicylate)** | 16475-90-4 | MSU: Known Sensitizer<br>AOEC: Asthmagen<br>Hazmap: Asthmagen | Used as a pharmaceutical intermediate | *Pharmaceutical* | Michigan State University Occupational and Environmental Medicine<br>Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma) |
| **Screw Worm Fly (parasitic maggot of the Cochliomyia hominivorax fly, a type of blowfly)** | n/a | MSU: Known Sensitizer<br>AOEC: Asthmagen<br>NYSDOH: Asthma Triggers | Parasitic insect | Flight crews | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New York State Department of Health – Occupational Asthmagens |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Seed Cocoon** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | Seeds or large beans of a tropical vine (Entada scandens) used for making purses and scent bottles | Bean harvester<br>Factory worker | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Sequoia sempervirens (California Redwood)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | Wood species | Exposure to pollen | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Sericin** | 60650-89-7 and 60650-88-6 | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | A protein created by Bombyx mori (silkworms) in the production of silk and it is used in cosmetics | Cosmetics<br>Hairdresser<br>Sericulture<br><br>*Textile* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Sheep Blowfly** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>NYSDOH: Asthma Triggers | Agricultural research facilities | research workers<br>*Agricultural* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New York State Department of Health – Occupational Asthmagens |
| **Shoreal Sp (Mahogany)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>Asmanet: Asthmagen | Wood species | Carpenter<br><br>*Timber* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Shrimp Meal** | n/a | MSU: Known Sensitizer<br>AOEC: Asthmagen<br>NYSDOH: Asthma Triggers<br>Asmanet: Asthmagen | Trout and salmon food | Seafood processor<br>Fish farmer | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New York State Department of Health – Occupational Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Sodium Metabisulfite (Sodium pyrosulfite, Sodium disulfite)** | 7681-57-4 | AOEC: Asthmagen<br>Asmanet: Asthmagen | Used as a food additive (preservative and antioxidant known as E223), and as cleaning agent for brewery and winemaking equipment, in reverse osmosis membranes in desalination systems, and tree stump removal | Arborist<br><br>*Brewery and wine*<br>*Food*<br>*Water treatment* | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Soldering Flux - Zinc Chloride and Ammonium Chloride** | n/a | NJDOH: Known Sensitizer<br>AOEC: Asthmagen | Solder | Solderer | New Jersey Department of Health – Work Related Asthma<br>Association of Occupational and Environmental Clinics (AOEC) |
| **Soluble Halogenated Platinum Compounds, NOS** | n/a | AOEC: Asthmagen | Calalysts, plating chemicals, photography, ore processing | *Chemical*<br>*Mining*<br>*Plating*<br>*Photography* | Association of Occupational and Environmental Clinics (AOEC) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Soy Flour (Soya Flour)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | Soy Flour | Baker<br><br>*Agriculture*<br>*Food* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Soybean Lecithin** | 90320-57-3 | AOEC: Asthmagen | Food additive | *Food* | Association of Occupational and Environmental Clinics (AOEC) |
| **Spiramycin (Foromacidin; Leucomycin; Provamycin; Rovamycin)** | 8025-81-8 | AOEC: Asthmagen<br>EU: Known Respiratory Sensitizer<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | Pharmaceutical - antibiotic | *Pharmaceutical* | Association of Occupational and Environmental Clinics (AOEC)<br>European Union Health and Safety Executive<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Sterculia (Karaya)** | n/a | AOEC: Asthmagen<br>Asmanet: Asthmagen | The gum from this tree is used as thickener and emulsifier in foods, as a laxative, and denture adhesive | Carpenter<br><br>*Dentistry*<br>*Food* | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Styrene (Vinyl benzene; cinnamene; styrol; phenethylene; phenylethene; diarex HF 77; styrolene; styropol)** | 100-42-5 | AOEC: Asthmagen<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>CHE: Asthma - Allergic Limited<br>Asmanet: Asthmagen | Used building and construction plastic foam insulation, epoxy adhesives, loose mineral wool fiber (blowing and pouring), miscellaneous paint-related products, nonstructural caulking compounds and sealants, automotive chemicals, rubber floor and wall coverings (including cove base, wainscoting, etc.)., scatter rugs, bathmats, and sets (rugs 6 x 9 ft and smaller), sheet vinyl flooring, synthetic resin and rubber adhesives , aerosol paint concentrates, plasticizers - Phthalates, industrial product finishes,. and packaging inks: water types | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Subtilisin (Esperase)** | 9014-1-1 | AOEC: Asthmagen<br>Asmanet: Asthmagen<br>NYSDOH: Asthma Triggers<br>MSU: Known Sensitizer | Used as an additive for washing agents | Detergent factory worker | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet)<br>New York State Department of Health – Occupational Asthmagens<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Sulfathiazole** | 72-14-0 | CHE: Asthma - Allergic Good | Aquarium antimicrobial disinfectants | Aquarium worker<br><br>*Chemical* | The Collaborative on Health and the Environment (CHE) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Sulfites (Sulphites)** | n/a | Hazmap: Asthmagen<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | Used to arrest fermentation also as a preservative in wine; often used as preservatives in dried fruits, preserved radish, and dried potato products | Brewer<br>Winemaker<br><br>*Food* | Hazmap (Chemicals Associated with Occupational Asthma)<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Sulfur Dioxide (SO2)** | 7446-09-5 | CHE: Asthma - Irritant Strong | Used as a precursor to sulfuric acid, a preservative for dried apricots (sometimes called E220), as an antibiotic and antioxidant in winemaking,<br>winery sanitation compound, to treat chlorinated wastewater prior to release, a refrigerant and a reagent and solvent in the laboratory | HVAC mechanic<br>Laboratory worker<br><br>*Food*<br>*Wine* | The Collaborative on Health and the Environment (CHE) |
| **Sulfuric Acid (sulphuric acid)** | 7664-93-9 | AOEC: Asthmagen<br>Asmanet: Asthmagen | Used in acrylic fiber, circuit Board manufacture (imaging copper etch, wire materials, wet chemical etchants),electroplating, sulfur-based fertilizers, flotation agents, pickling Acids for steel manufacturing, acids, Derivatizing Reagents for labs, machinery clean wash agents, odor agents, pH regulation agents, acid non-household metal cleaners (liquid), and household hard surface cleaners (liquid) | Factory worker<br>Laboratory worker<br>Janitorial worker<br><br>*Chemical*<br>*Dying*<br>*Healthcare*<br>*Printer* | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Tall Oil Rosin** | 8052-10-6 | AOEC: Asthmagen<br>Asmanet: Asthmagen | Used resin and rubber adhesives, epoxy adhesives, foam insulation, sealants<br>Impregnation agents (for fibrous materials - monomers), Impregnation Agent for pulp and paper manufacturing, tufted carpets and rugs, rubber floor and wall coverings, building insulation (polystyrene rigid foam insulation), loose fiber (blowing and pouring)/fireproofing, and sheet vinyl flooring | Rubber tire factory worker<br>Rubber worker<br><br>*Construction*<br>*Pulp/ Paper* | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Tall Oil, Crude** | 8002-26-4 | AOEC: Asthmagen<br>Hazmap: Asthmagen | Unprocessed tall oil | Pulp millworker | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma) |
| **Tannic acid (Acidum tannicum, Gallotannic acid, Digallic acid, Gallotannin, Tannimum, Quercitannin)** | 1401-55-4 | CHE: Asthma - Allergic Good | Used in chemical staining of wood, mordant used in the dyeing process for cellulose fibers such as cotton, an after treatment to improve wash fastness properties of acid dyed polyamide, anti-staining agent for polyamide yarn or carpets, in textile application of tannic acid is the activation of flock, corrosion inhibitor, as process aids in beer clarification, aroma compound in soft drinks and juices; natural clarifying agent, color stabilizer and taste enhancer for wine, as an anti-diarrhea agent | Woodworker<br>Painter<br><br>*Food*<br>*Pharmaceutical*<br>*Textile* | The Collaborative on Health and the Environment (CHE) |
| **Tea** | n/a | AOEC: Asthmagen<br>Asmanet: Asthmagen | Tea | Tea processor | Association of Occupational and Environmental Clinics (AOEC)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Tetrachlorophthalic anhydride (Phthalic anhydride, tetrachloro ;Niagathal;Tetrachlorophthalic anhydride)** | 117-08-8 | AOEC: Asthmagen<br>Hazmap: Asthmagen<br>CHE: Asthma - Allergic Strong<br>EU: Known Respiratory Sensitizer | Used a flame retardant in epoxy resins | *Multiple Industries* | Association of Occupational and Environmental Clinics<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>The Collaborative on Health and the Environment (CHE)<br>EU Health and Safety Executive List |
| **Tetracycline** | 60-54-8 | AOEC: Asthmagen<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>Asmanet: Asthmagen | Pharmaceutical - bacterial infections and acne, | *Pharmaceutical* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Tetramethrin (Cyclopropanecarboxylic acid)** | 7696-12-0 | AOEC: Asthmagen<br>Hazmap: Asthmagen | Insecticide | Exterminator | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma) |
| **Tetrazene** | 70816-59-0 | AOEC: Asthmagen<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer | Used in priming compositions of explosives | Detonator factory worker<br><br>*Explosives* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens |
| **Thuja occidentalis (Eastern White Cedar, Yellow Cedar, American Arborvitae, Arbor Vitae, Atlantic White Cedar, Cedrus Lycea, False White Cedar, Hackmatack, Lebensbaum, Thuia du Canada, Thuja)** | n/a | AOEC: Asthmagen - Generally Accepted | Wood species | Carpenter | Association of Occupational and Environmental Clinics (AOEC) |
| **Thuja plicata (Western Red Cedar)** | n/a | AOEC: Asthmagen - Generally Accepted<br>MSU: Known Sensitizer<br>Asmanet: Asthmagen | Wood species | Carpenter<br><br>*Timber* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Tobacco Smoke (Active smoking)** | n/a | CHE: Asthma - Irritant Strong | n/a | *Multiple Industries* | The Collaborative on Health and the Environment (CHE) |
| **Tobacco Smoke (Secondhand)** | n/a | CHE: Asthma - Irritant Strong | n/a | *Multiple Industries* | The Collaborative on Health and the Environment (CHE) |
| **Toluene (toluol)** | 108-88-3 | CHE: Asthma - Irritant Limited | Toluene is a solvent that can dissolve: paints, paint thinners, silicone sealants, many chemical reactants, rubber, printing ink, adhesives, lacquers, leather tanners, and disinfectants.<br>It can also be used as a raw material for toluene diisocyanate (used in the manufacture of polyurethane foam) and TNT, and as an octane booster in gasoline fuels used in internal combustion engines | *Multiple Industries* | The Collaborative on Health and the Environment (CHE) |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Toluene diisocyanate (TDI, Tolylene diisocyanate, Methyl phenylene diisocyanate)** | 584-84-9 | AOEC: Asthmagen<br>EU: Known Respiratory Sensitizer<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>Asmanet: Asthmagen<br>CHE: Asthma - Allergic Strong | Polyurethane foam products | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>European Union Health and Safety Executive<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet)<br>The Collaborative on Health and the Environment (CHE) |
| **Tragacanth (Shiraz gum, gum elect, gum dragon)** | 9000-65-1 | AOEC: Asthmagen<br>MSU: Known Sensitizer | Used as an emulsifier, thickener, stabilizer, and texturant additive (E413) | *Food*<br>*Pharmaceutical* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Tributyltin Oxide (TBTO)** | 56-35-9 | AOEC: Asthmagen<br>CHE: Asthma - Irritant Good | Biocide (fungicide and molluscicide) | Carpenter | Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE) |
| **Triethanolamine (TEA, TEOA)** | 102-71-6 | AOEC: Asthmagen<br>CHE: Asthma - Allergic Strong<br>NYSDOH: Asthma Triggers<br>Hazmap: Asthmagen | Used primarily as liquid laundry detergents, dishwashing liquids, general cleaners, hand cleaners, polishes, metalworking fluids, paints and printing inks, ear drops and as a pH balancer in some cosmetic products such as creams and milks, skin lotions, eye gels, moisturizers, shampoos, and shaving foams | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>New York State Department of Health – Occupational Asthmagens<br>The Collaborative on Health and the Environment (CHE) |
| **Triethylene Tetramine (TETA, 1,2-Ethanediamine,N,N'-bis(2-aminoethyl)** | 112-24-3 | AOEC: Asthmagen<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>NYSDOH: Asthma Triggers<br>CHE: Asthma - Irritant Limited | Used in epoxy curing agents, fabric softeners, lube oil and fuel additives, asphalt additives, paper wet-strength resins, and aircraft filters | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>New York State Department of Health – Occupational Asthmagens<br>The Collaborative on Health and the Environment (CHE) |
| **Triglycidyl isocyanurate (TGIC)** | 2451-62-9 | Hazmap: Asthmagen<br>Asmanet: Asthmagen | Used as a curing agent in powder coating | Spray painter | Hazmap (Chemicals Associated with Occupational Asthma)<br>The Table of Agents and Substances that cause Occupational Asthma (Asmanet) |
| **Trigonella foenum-graecum (Fenugreek)** | 68990-15-8 | AOEC: Asthmagen | Used as a spice and herb | Herbalist<br>*Food* | Association of Occupational and Environmental Clinics (AOEC) |
| **Trimellitic anhydride (Trimellitic Acid Cyclic 1,2-anhydride; Anhydro trimellitic acid; 1,2,4-benzenetricarboxylic acid cyclic 1,2-anhydride; 1,2,4-Benzenetricarboxylic anhydride; 4-carboxyphthalic anhydride)** | 552-30-7 | AOEC: Asthmagen<br>Hazmap: Asthmagen<br>CHE: Asthma - Allergic Good<br>EU: Known Respiratory Sensitizer | Used in the production of resins for electrode-position and powder coatings, and as a binder for glass fibers, and other aggregates, an embossing agent for vinyl flooring as an intermediate for the synthesis of surface coatings chemicals, adhesives, polymers,dyes and printing inks | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>The Collaborative on Health and the Environment (CHE)<br>EU Health and Safety Executive List |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Trimethylhexanediamine + Isophorondiamine** | n/a | AOEC: Asthmagen<br>Hazmap: Asthmagen<br>NYSDOH: Asthma Triggers<br>CHE: Asthma - Allergic Strong | Flooring | Floor installer<br>Salesperson | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>New York State Department of Health – Occupational Asthmagens<br>The Collaborative on Health and the Environment (CHE) |
| **Trimethylolpropane Triacrylate (TMPTA)** | 15625-89-5 | AOEC: Asthmagen | Used in manufacturing coatings, inks and adhesives; end applications include alkyd coatings, compact discs, hardwood floors, concrete polymers, dental polymers, lithography, letterpress, screen printing, elastomers, automobile headlamps, acrylics and plastic components for the medical industry | *Multiple Industries* | Association of Occupational and Environmental Clinics (AOEC) |
| **Triplochiton scleroxylon (African Maple)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | Wood species | Carpenter<br>Sauna builder<br><br>*Timber* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Trout** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | Fish | *Food* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Trypsin** | 9002-07-7 | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>CHE: Asthma - Allergic Strong<br>Asmanet: Asthmagen | Used for biotechnological processes | Laboratory worker | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Tungsten carbide (WC)** | 12070-12-1 | AOEC: Asthmagen<br>Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer<br>CHE: Asthma - Allergic Limited<br>Asmanet: Asthmagen | Used in industrial machinery, tools, abrasives, armor-piercing ammunition, and jewelry | Grinder<br>Jeweler<br>Machine shop worker | Association of Occupational and Environmental Clinics (AOEC)<br>Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens<br>The Collaborative on Health and the Environment (CHE)<br>The Table of Agents and Substances that cause Occupational Asthma |
| **Tylosin** | 1401-69-0 | Hazmap: Asthmagen | Veterinary medicine - treating bacterial infections | *Veterinary Medicine Pharmaceutical* | Hazmap (Chemicals Associated with Occupational Asthma) |
| **Tylosin Tartrate (Tylosin tartrate;tylosin solution)** | 1405-54-5<br>74610-55-2 | AOEC: Asthmagen<br>MSU: Known Sensitizer | Veterinary medicine - treating bacterial infections | *Veterinary Medicine Pharmaceutical* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma |
| **Urea formaldehyde (Urea-methana, Acrisin FS 017)** | 9011-05-6 | Hazmap: Asthmagen<br>MSU: Known Sensitizer | Composite wood products, insulation, furniture, and adhesives | *Construction Chemical* | Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational and Environmental Medicine |

| SUBSTANCE (SYNONYMS) | CAS # | ASTHMAGEN / ASTHMA TRIGGER | COMMONLY FOUND IN | OCCUPATION / *INDUSTRY* | SOURCES |
|---|---|---|---|---|---|
| **Vanadium** | 7440-62-2 | CHE: Asthma - Allergic Strong | Used as alloy material | Foundry worker | The Collaborative on Health and the Environment (CHE) |
| **Vicia sativa (Common Vetch)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer | A weed used as a livestock fodder | *Agriculture* | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational and Environmental Medicine |
| **Welding Fume, Stainless Steel** | n/a | AOEC: Asthmagen | Welding processes | Welder | Association of Occupational and Environmental Clinics (AOEC) |
| **Wheat Flour** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>Asmanet: Asthmagen | Wheat Flour | Baker<br>Miller | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>The Table of Agents and Substances that cause Occupational Asthma (Asthmanet) |
| **Wood dust** | n/a | NYSDOH: Asthma Triggers<br>NJDOH: Known Sensitizer<br>MSU: Known Sensitizer<br>AOEC: Asthmagen<br>CHE: Asthma - Allergic Strong<br>EU: Known Respiratory Sensitizer | From multiple wood species | Carpenter<br>Furniture maker<br>Wood turner<br>Woodworker<br><br>*Paper/ pulp*<br>*Timber* | New York Department of Health – Occupational Asthmagens<br>New Jersey Department of Health – Work Related Asthma<br>Michigan State University Occupational and Environmental Medicine<br>Association of Occupational and Environmental Clinics (AOEC)<br>The Collaborative on Health and the Environment (CHE)<br>European Union Health and Safety Executive |
| **Zabrotes subfasciatus (Mexican Bean Weevil)** | n/a | AOEC: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer | n/a | Pea processer | Association of Occupational and Environmental Clinics (AOEC)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens |
| **Zinc Chloride (zinc dichloride, zinc (II) chloride, butter of zinc, zinc butter, zinc chloride fume)** | 7646-85-7 | Hazmap: Asthmagen<br>MSU: Known Sensitizer<br>NJDOH: Known Sensitizer | Used in acrylic fiber, flux agents for casting metal, plywood and paperboards a preservatives, reprographic, welding and soldering agents and flux ingredients | Galvanizer<br>Metalworker<br>Solderer<br>Welder<br><br>*Electronics* | Hazmap (Chemicals Associated with Occupational Asthma)<br>Michigan State University Occupational & Environmental Medicine Table of Asthma<br>New Jersey Department of Health and Senior Services – Industries and Asthmagens |
| **Zinc Oxide (Zinc white, calamine)** | 1314-13-2 | AOEC: Asthmagen | Used in vulcanization of rubber, additive also protect rubber from fungi, concrete, in calamine lotion, as an antibacterial , cosmetics, and sunscreen | Cosmetics<br>Rubber workers | Association of Occupational and Environmental Clinics (AOEC) |

# Glossary of Terms

## Asthma
Asthma is a a chronic lung disorder that is marked by recurring episodes of airway obstruction manifested by labored breathing accompanied especially by wheezing and coughing and by a sense of constriction in the chest, and that is triggered by hyperreactivity to various stimuli

## Asthma –Allergic Good
Asthma-Allergic good refers to an asthmagen that acts as allergen or senstizer linked to asthma with the strength of the evidence identified by the CollarborativeCollaborative for Health and the Environment as "Good. The "good evidence" category includes chemicals associated with a disease through epidemiological studies (cross-sectional, case-series, or case-control studies) or for chemicals with some human evidence and strong corroborating animal evidence of an association.

## Asthma – Allergic Strong
Asthma-Allergic strong refers to an allergen linked to asthma with the strength of the evidence identified by the Collaborative for Health and the Environment as "Strong". The "strong evidence" category is reserved for chemicals where a causal association with disease has been verified. The toxicity of these chemicals has been well-accepted by the medical community and is noted in the textbook references as, "It is well known that x chemical causes y condition" or "There is strong evidence that x compound causes y disease". Other chemicals were put into this category by causal associations drawn from more recent large prospective or retrospective cohort studies. Finally, chemicals listed as Group 1 human carcinogens by the International Agency for Research on Cancer (IARC) are included in this category. These are chemicals that have been determined to have sufficient evidence for causing cancer in humans.

## Asthma –Irritant Good
Asthma-Irritant Good refers to an asthmagen that acts an irritant and is inked to asthma with the strength of the evidence identified by the Collaborative for Health and the Environment as "Good. The "good evidence" category includes chemicals associated with a disease through epidemiological studies (cross-sectional, case-series, or case-control studies) or for chemicals with some human evidence and strong corroborating animal evidence of an association. Textbook statements such as, "There is evidence for an association between exposure to x compound and y disease." assumed good evidence. IARC Group 2A chemicals, those with limited evidence for causing cancer in humans and sufficient evidence in animals, also are included in this category.

## Asthma Irritant Limited
Asthma Irritant limited refers to an asthmagen that acts as an irritant and has been identified with the strength of the evidence identified by the Center for Health and the Environment as "Limited".

## Asthma – Irritant Strong
Asthma-Irritant Strong refers asthmagen that acts as an allergen or sensitizer and is linked to asthma with the strength of the evidence identified by the Collaborative for Health and the Environment as "Strong". The "strong evidence" category is reserved for chemicals where a causal association with disease has been verified. The toxicity of these chemicals has been well-accepted by the medical community and is noted in the textbook references as, "It is well known that x chemical causes y condition" or "There is strong evidence that x compound causes y disease". Other chemicals were put into this category by causal associations drawn from more recent large prospective or retrospective cohort studies. Finally, chemicals listed as Group 1 human carcinogens by the International Agency for Research on Cancer (IARC) are included in this category. These are chemicals that have been determined to have sufficient evidence for causing cancer in humans.

## Asthma Trigger
An asthma trigger is a substance or event that sets off asthma symptoms. There are many different asthma triggers, such as dust or paint. Triggers are not restricted to substances, and may include stressors like exercise. Triggers vary from person to person.

## Asthmagen
An asthmagen is any substance that is causally-related to the development of asthma symptoms. In the European Union the term for such substances is respiratory sensitizer.

## Bronchial Hyperresponsiveness
Bronchial hyperresponsiveness is exaggerated bronchial constriction most common in asthma, in response to nonspecific provocation, inhalation of various bronchoconstrictors, but also to physical challenges–eg, exercise, dry or cold air, hypertonic or hypotonic aerosols

## CAS#
CAS (Chemical Abstract Service) registry numbers are unique numerical identifiers for chemical elements, compounds, polymers, biological sequences, mixtures and alloys. They are referred to in this report as CAS numbers or CAS #s.

## Combustion Sources
Combustion sources include environmental tobacco smoke, unvented kerosene and gas space heaters, woodstoves, fireplaces, and gas stoves. The major pollutants released are carbon monoxide, nitrogen dioxide, and particles. Unvented kerosene heaters may also generate acid aerosols.

## Disability-adjusted Life Years (DALYs)
The disability-adjusted life year (DALY) is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death.

## Inhaled Corticosteroids
Inhaled corticosteroids prevent and reduce swelling in the airways. They also make the airways less sensitive to triggers. These drugs are taken every day by people with chronic asthma.

## Irritant
Non-senstizing irritant substances that when inhaled act as an asthma trigger. They differ from other asthmagens in that they do not act by generating an immune response.

# Glossary of Terms, Cont.

## Manufactured Substances
A manufactured substance is a non-naturally occurring substance, such as ethyl methacrylate.

## Naturally Occurring
A naturally occurring substance refers to a non-manufactured substance, that exists by nature and without artificial aid, such as animal dander.

## Non-sensitizing Asthmagens (Irritants).
Substances that induce Reactive Airways Dysfunction Syndrome (RADS) or Irritant-induced Asthma

## Noxious Land Use
Noxious land uses are environmental hazards and include, but are not limited to, landfills, incinerators, and sewage treatment plants.

## Reactive Airways Dysfunction Syndrome (RADS)
An irritant induced non-immunological asthma without a latency period.

## Respiratory Sensitizer
As used in the European Union, this term is synonymous with asthmagen, and includes any substance that can induce or initiate the state of airway hypersensitivity without regard to the underlying mechanism of action.

## Senstizing Asthmagens
As used in this report this term includes substances that cause an immunological response leading to asthma symptions.

## Short-acting Beta-agonists
Short-acting beta-agonists are a type of bronchodilator used for the acute relief of asthma symptoms. SABA stands for short acting beta agonist, the most common one being albuterol.

## Substance
Materials, naturally or non-naturally occurring, that trigger the onset of or aggravate asthma.

## Volatile Organic Compounds (VOCs)
Volatile organic compounds (VOCs) are emitted as gases from certain solids or liquids. Examples include: paints and lacquers, paint strippers, cleaning supplies, pesticides, building materials and furnishings, office equipment such as copiers and printers, correction fluids and carbonless copy paper, graphics and craft materials including glues and adhesives, permanent markers, and photographic solutions.

# APPENDIX

# 1. List of Substances Linked To Asthma

Compiled from lists produced by government, academic, and third-party sources

(2-AMINOETHYL)ETHANOLAMINE
1,1-dichloroethane
1,1'-Methylenebis(4Isocyanatobenzene), (Methylene Diisocyanate)
1,2-Benzisothiazolin-3-one
1,2-Dibromo-3-chloropropane, (dibromochloropropane or DBCP)
3-Amino-5-mercapto-1,2,4-triazole
4-Methylmorpholine
Abiruana
Acarian (of or caused by mites or ticks)
Acephate
Acetaldehyde
Acrolein (Acraldehyde; Acrylic Aldehyde; Allyl Aldehyde; Ethylene Aldehyde; 2-Propenal )
Aerosols
African Maple
African Zebrawood
Air pollution
Alkyl Aryl Polyether Alcohol / Polypropylene Glycol
Alternaria
Aluminum
Aluminum Chloride
Aluminum Oxide (Aluminum oxide; Alumina; activated Alumina; alpha-Alumina)
Aluminum Oxide (Corundum)
Aluminum smelting
Amines
Aminoethyl Ethanolamine
Ammonia
Ammonium Bichromate (commonly known as Hexavalent Chromium)
Ammonium Hexachloroplatinate (IV)
Ammonium Persulphate
Amprolium
Amylase
Anesthetic Gases, Halogenated
Animal antigens
Arabidopsis Thaliana
Ashwood
Aziridine
Azodicarbonamide (1,1'-Azobisformamide)
Baby's Breath
Bacillus Subtilis (Subtilsins)
Barn Mite
Bat Guano
Bee Moth
Benzalkonium Chloride
Benzene
Benzyl Butyl Phthalate
Benzyl-C10-16-alkyldimethyl, chlorides
Benzyl-C12-16-alkyldimethyl, chlorides
Benzyl-C12-18-alkyldimethyl, chlorides
Benzyldimethylstearylammonium Chloride
Bis(tri-n-butyltin)oxide
Black Henna
Brazil Ginseng
Bromelain
BTC 776
BTC 927
Buckwheat
Cabreuva
Cacoon Seed
California Redwood
Caprolactam
Captafol (Difolatan)
Carbamates
Carene
Carmine
Casein
Castor Bean
Cat
Cedar of Lebanon
Central American Walnut
Cephalosporins
Cetalkonium Chloride
Chamomile
Chicken
Chicory
Chlorendic anhydride
Chlorhexidine (Hibiclens)
Chlorine
Chloroamine
Chloroamine T
Chloroform
Chlorothalonil (Tetrachloroisophthalonitrile)
Chorella Algae
Chromic Acid
Chromium
Chromium Compounds
Chromium, Hexavalent
Chrysoperla Carnea
Cibachrome Brilliant Scarlet 32
Cimetidine
Cinnamon
Clam
Coal dust
Cobalt
Cocabolla
Codeine (3-methylmorphine )
Coffee Bean
Colophony (or Rosin) [BALS 3A]
Cotton Dust
Cow Dander
Crab
Cricket
Cutting Oils (Oil Mist)
Cuttlefish
Cyanoacrylates
Daphnia
"Di-2-ethylhexylphthalate [Bis(2-Ethylhexyl)Phthalate]
Dialkyl Methyl Benzyl Ammonium Chloride
Diazinon
Diazonium salt (diazonium tetrafluoroborate and p-diethylaminobenzenediazonium chloride)
Dicyclohexyl Phthalate
Dicyclohexylmethane 4,4-diisocyanate (Hydrogenated MDI)
Didecyl Dimethyl Ammonium Chloride
Diesel Exhaust
Diethanolamine (DEA)
Di-isocyanates
Dimethoate
Dimethyl Ethyl Benzyl Ammonium Chloride
Dimethyl Sulfate
Dioscorea Batatas
Dodecyl-dimethyl-benzylammonium Chloride
Drimaren Brilliant Blue K-BL
Drimaren Brilliant Yellow K-3GL
Eastern White Cedar
Ebony
Egg Lysozyme
Egg Protein
Enzymes
Ephestia Kuehniella
EPO 60
Epoxy Resins
Esperase
Ethanolamine (2-Aminoethanol), Monoethanolamine
Ethoxylated bisphenol A diacrylate
Ethyl Cyanoacrylate (aka. Ethyl-2-cyanoacrylate)
Ethyl methacrylate
Ethylene amines
Ethylene Oxide
Ethylenediamine (1,2-Diaminoethane)
FD&C Blue Dye #2
Fenthion

Fenugreek
Fernambouc
Fiber dust
Fish Feed
Flaviastase
Flour, NOS
Fluorine
Formaldehyde
Fowl Mite
Freesia
Freon (Chlorofluorocarbon), Heated
Frog
Fruit Fly
Fungal Amylase
Fungal Amyloglucosidase
Fungal antigens
Fungal Hemicellulase
Furfuryl alcohol
Garlic Dust
Gas Metal Arc Welding on Uncoated Mild Steel
Glacial Acetic Acid
Glacial Acetic Acid (Acetic acid, methane carboxylic acid; ethanoic acid )
Glacial Acetic Acid (Acetic acid, methane carboxylic acid; ethanoic acid )
Glutaraldehyde (aka Cidex)
Gluten
Grain Dust
Grain Mite
Green Beans
Guar
Guinea Pig Antigens
Gum Arabic
Gutta-percha
Hard Metal
Henna
Hexachlorophene
Hexahydrophthalic anhydride
Hexamethylene diisocyanate (HDI)
Hexamethylene tetramine
Himic anhydride
Honeybee
Hops
Hydralazine (Phthalazine,1-hydrazinyl-)
Hydrochloric Acid (Acid Aerosols)
Hydrogen Sulfide
Insect antigens
Ipecac
Ipecacuanha
Iroko
Isocyanates
Isoniazid
Isonicotinic Acid Hydrazide
Iso-nonanoyl oxybenzene sulfonate
Isophorone diisocyanate (IPDI)
Kapok
Karaya
Kejaat
Kotibe
L. Caesar Larva
Lactoserum
Lanasol Yellow 4G
Latex
Lathyrus Sativus
Lauryl dimethyl benzyl ammonium chloride (Dodecyl-dimethyl-benzylammonium Chloride)
Leptinotarsa Decemlineata
Lesser Mealworm
Levafix Brilliant Yellow E36
Limonen, D [(+)-4-ISOPROPENYL-1-METHYLCYCLOHEXENE]
"Limonene (4-isopropenyl-1-methylcyclohexene Racemic: DL-limonene; dipentene)"
Limonium Tataricum
Linseed Oilcake
Locust
Lycopodium
Mahogany
Malathion
Maleic anhydride
Metal fumes
Methacrylates
Methyl 2-cyanoacrylate
Methyl Blue (Cotton blue, Helvetia blue, Acid blue 93)
Methyl methacrylate
Methyl tetrahydrophthalic anhydride
Methylchloro-isothiazolinone
Methyldopa
Methylene Bisphenyl Isocyante (MDI; Diphenylmethane diisocyante)
Mexican Bean Weevil
Mice
Mites, NOS
Mitoxantrone
Monascus ruber (food colorant)
Monoethanolamine (Monoethanolamine; Ethanolamine; beta-Aminoethanol, ethylolamine; glycinol)
N,N-Dimethyl-1,3-propanediamine (DMAPA)
N,N-Dimethylethanolamine (Dimethylethanolamine)
Nacre Dust
Naphthalene Diisocyanate
N-Dioctyl-phthalate
Nemacur
Neurospora
New Mexico Range Moth Caterpillar
Nickel
Nickel Compounds
Ninhydrin
Nitrogen chloride
Nitrogen Dioxide
N-Methylmorpholine
Oak
Oil fly ash
Oil mist, mineral
Opiate Compounds (Morphine)
Organophosphates
Orthophenylphenol
Osmium Tetraoxide
Ostrinia Nubilalis
Ozone
Palladium
Pancreatin
Papain
Paprika
Paraformaldehyde
Parathion
Particulate air pollution (soot)
Pau Marfim
Pectin
Penicillamine
Penicillins (AMPICILLIN)
Penicillium
Pepsin
Peroxyacetic Acid
Persulfate Salts
Phenols
Phenylglycine Acid Chloride
Phosgene
Phthalates
Phthalic anhydride
Pig
Pinellia Ternata
Piperazine dihydrochloride
Plant pollens
Plastic dusts
Plastic fumes
Platinum
Plutonium-239 and its decay products (may contain Plutonium-240)
Polyethylene Terephthalate/Polybutylene Terephthal
Polyfunctional aziridine (Trimethylolpropane tris(2-methyl-1-aziridine propionate))
Polymethylene Polyphenyl isocyanate (PPI)
Polypropylene (Heated)
Polyvinyl Chloride [PVC] (dust or heated, Thermal Decomposition Products)
p-Phenylene diamine ("Black Henna")
Prawn
Propionaldehyde
Psyllium
Pyrethins / Pyrethroids
Pyrfon
Pyromellitic dianhydride
Quaternary Ammonium Compounds
Quillaja Bark
Rabbit Antigens
Radiographic Fixative
Ramin
Rat Antigens
Reactive Dyes
Red Soft Coral
Rhodium

Rice Dust
Rifacion Orange HE 2G
Rifafix Yellow 3 RN
Rifazol Black GR
Rifazol Brilliant Orange 3R
Rose Hips
Rye Flour
Safrotin
Salbutamol Intermediate
Screw Worm Fly
Senna
Sericin
Sheep Blowfly
Shrimp Meal
Silkworm
Sodium Metabisulfite
Soldering Flux, Zinc Chloride/Ammonium Chloride
Soluble Halogenated Platinum Compounds, NOS
Soya Flour
Soybean Lecithin
Spiramycin
Styrene (Vinyl benzene; cinnamene; styrol; phenethylene; phenylethene; diarex HF 77; styrolene; styropol)
Subtilase
Sulfathiazole
Sulfites (Sulphites)
Sulfur Dioxide
Sulfuric Acid
Sunflower
Tall Oil Rosin
Tall Oil, Crude
Tanganyika Aningre
Tannic acid
TDI Prepolymers
Tea
Tetrachloroisophthalonitrile
Tetrachlorophthalic anhydride
Tetracycline
Tetramethrin
Tetrazene
Tobacco Leaf
Tobacco Smoke (Active smoking)
Tobacco Smoke (Secondhand)
Toluene
Toluene diisocyanate (TDI)
Tragacanth
Tributyl Tin Oxide
Triethanolamine
Triethylene Tetramine
Triglycidyl isocyanurate
Trimellitic anhydride
Trimethylhexanediamine + Isophorondiamine
Trimethylolpropane Triacrylate/2-Hydroxypropyl Acrylate
Trout
Trypsin
Tungsten carbide
Tylosin
Tylosin Tartrate
Urea Formaldehyde (Acrisin FS 017)
Vanadium
Vicia Sativa
Weeping Fig
Welding Fume, Stainless Steel
Western Red Cedar
Wheat Flour
Wood Dust
Zinc Chloride fume
Zinc Oxide

# 2. List of Where Substances Linked To Asthma are Found

Compiled from lists produced by government, academic, and third-party sources

Acid non-household metal cleaners (liquid)
Acoustical ceiling panel
Acoustical mineral wool (such as wall and ceiling - sold as acoustical insulation)
Acrylic adhesives
Acrylic Fiber Manufacture – Solvents
Acrylic Fiber Manufacture Solvents - Acrylic Fibers
Acrylic Fibers
Adhesive films
Adhesive removers
Adhesives
Adhesives (Diisocyanates)
Adhesives Manufacture (Furniture Adhesive Resins)
Aerosol concentrate (resin)
Aerosol paint concentrates
Aerosol paint concentrates (spray: enamels, lacquers, finishes, epoxy, paint, primer, flame proof coating, varnish)
Aerosol sterilization agents
Agriboard
Agricultural chemicals
Alkyd primer
Alkyd semi-gloss paint
All Purpose cleaner (aerosol)
Animal-Feed Additives
Antibiotics
Artificial flowers
Paints
Auto
Autobody polish and cleaners
Automobile body polish and cleaners
Automotive windshield washer fluid
Bathmats
Bathroom tub and tile cleaners
Bleaching Agents - textile bleaching agents
Bleaching Agents (textiles)
Building airplane models
Building and construction insulation (polystyrene rigid foam insulation)
Building and construction plastic foam insulation
Carpet Adhesive Solvents
Carpet deodorizer
Chrome Plating
Circuit Board manufacture – Imaging Copper Etch
Circuit Board Manufacture (Imaging Copper Cleaners
Circuit Board Manufacture (Printed circuit board wire materials)
Circuit Board Manufacture Imaging Cleaners
Cleaning products
Coal and oil fuel
Coatings Manufacture (Diisocyanates)
Cobalt
Condom Manufacturing
Cosmetics
Crimson ink
Curing agents
Cutting oils
Degreasers
Deodorants/air fresheners
Derivatizing Reagents
Disinfectants (nonagricultural)
Disinfectants (nonagricultural)
Drain pipe solvents
Dried flowers
Dye
Elastomers (Diisocyanates)
Electroplating – Acid Metal Cleaners/Oxide Removers
Epoxy Adhesives
Epoxy Resins
Explosives
Fertilizers – Sulfur-based
Fertilizers (Controlled (slow) Release Materials)
Fertilizers (Sulfur-based)
Flame retardants
Flat water thinned interior paints and tinting bases
Flexible Foam (Diisocyanates)
Flexible lined sheetmetal ductwork
Floor cleaner
Floor polish: liquid non-emulsion
Floor underlayment
Flooring
Flotation Agents – Depressants/Nonsulfide Ores
Flotation Agents (Depressants - Sulfide Ores)
Flush type doors
Foam insulation
Foam molding
Formaldehyde
Fungicides for agric.
Furniture polish and cleaners
Garden and health service use
General performance sealants (PVAC, Butyl, Vinyl, etc.)
Glass window cleaning preparations
Glass wool insulation
Glass Wool-batts
Glazing
Glues
Gravure inks (furniture laminates, paneling, food packaging, wall paper, magazines, greeting cards)
Hair coloring preparations
Hair dye
Hair rinses
Hardwood face
Heat Transfering Agents(Low-level Heat-transfer Media)
Heat Transferring Agents - Low-level Heat-transfer
Histamine
House plants
Household hard surface cleaners (aerosol)
Household hard surface cleaners (dry)
Household hard surface cleaners (liquid)
Household laundry presoaks
Household laundry starch preparations
Household liquid laundry detergents
Household liquid scouring cleaners
Household rug and upholstery cleaners
Household synthetic light duty detergent (liquid)
Imaging Copper Etch
Impregnation Agents (For Fibrous Materials - Monomers)
Industrial particleboard (furniture, fixtures, cabinets etc.)
Inner Layer Etching - Print Circ Brd Mfg
Insulating Materials (Thermal Insulation - Foams)
Integrated Iron and Steel Mfg - Pickling Acids
Integrated Iron and Steel Mfg (Pickling Acids)
Interior solvent thinned paints
Laboratory Chemicals (Acids and Derivatizing Reagents)
Laboratory Chemicals (Organics)
Laboratory Chemicals (Solvents - Dilution)
Lacquers
Latex flat paint
Latex Primer
Laundry starch preparations
Leather (Synthetic Organic Leather Tanning Agents)

Leather/Suede dressings and finishes
Linoleum
Loose fiber (blowing and pouring)/fireproofing
Lubricating and similar oils
Lubricating oils
Lucite
Machinery Mfg and Repair – Clean wash agents
Making PCB Holes Conductive and Outer Layer Etch/Plate - Print Circ Brd Mfg)
Manufacture polyester resins
Manufacturing aircraft filters
MDF
Media Pulp and Paper Manufacture - Bleaching agents
Medium density fiberboard
Metal Casting Flux Agents for Casting-Metal Casting Flux
Metal Degreasing (Terpene cleaners)
Metalworking or machining fluids
Mineral wool building batts
Mining
Miscellaneous paint-related products
Mobile home decking
Natural Rubber
Nickel
Nonstructural caulking compounds and sealants
Non-wood upholstered office side and arm chairs
Nylon-6
Odor Agents - Catalysts
Odor Agents - Catalysts
Odor Agents – Initial Scrubber Chemicals
Office work
Oleo
Other alkaline household detergents
Other alkaline non-household detergents (liquid)
Other automotive chemicals
Other hair preparations including heat setting wave solutions
Other indust. product finishes excl. pigment dispersions & ink vehicles
Other industrial chemical specialty products
Other industrial product finishes (heat-sealable overprint-CAP)
Other industrial product finishes excl. pigment dispersions & ink vehicles.
Other interior water thinned coatings
Other laundry aids
Other laundry aids including ironing aids and dry cleaning spotting pretreatment)
Other non-household pesticides
Other polishing preparations and related products
Other products incl metal polish
Other rubber floor and wall coverings incl cove base
Other soaps incl mechanics and medicated
Other soaps incl mechanics and medicated (bars liquid and paste)
Other specialty cleaning and sanitation products
Other specialty cleaning and sanitation products
Other synthetic resin and rubber adhesives
Outer Layer Etch/Plate - Print Circ Brd Mfg)
Oven cleaners
Oven cleaners
Oxidation of Wafers and Wet Chemical Etching)
Packaging inks: solvent types (inks
Paint
Paint and varnish removers
Paint manufacture (Hydrocarbon solvents)
Paper Coating (Solvents)
Paper Coatings (Process Regulators - Paper Coating)
Particleboard
Particleboard floor underlayment
Pesticide Mfg (Herbicides) (Solvents - Herbicide Manufacture)
Pesticides
Pesticides Mfg (Herbicides and Insecticides)
pH Adjustors for Water Treatment
pH Regulation Agents (pH Adjustors for Wastewater and pH Adjustors for Water Treatment)
Pharmaceutical
Pharmaceutical preparations
Pharmaceuticals Mfg (Solvents - Pharmaceuticals)
Photochemicals (Hardeners)
Photochemicals Oxidizing Agents – Silver
Plasticizers - Phthalates (Softeners)
Platinum
Plexiglass Dust
Plywood and Paperboard Manufacture (Adhesive resins)
Polish
Pollens
Polyurethane
Polyurethane foam
Polyurethane liquid plastic
Polyvinyl acetate (latex type) adhesive
Prefinished hardwood plywood
Preserved wood
Printed Circuit Board Manufacturing - making PCB holes conductive
Printed Circuit Board Manufacturing (Hot Air Solder Leveling-Print Circ Brd Mfg
Printed Circuit Board Manufacturing (Making PCB Holes Conductive)
Printed Circuit Board Manufacturing Hot Air Solder Leveling-Print Circ Brd Mfg
Printed Circuit Board Mfg – Hot Air Solder Leveling – Print Circ.Board Mfg
Printed circuit board wire materials and Wet chemical etchants)
Printing (Solvents for Equipment cleaning)
Printing (solvents for flexography and gravure printing)
Pulp and Paper Manufacture (Bleaching agents)
Pulp and Paper Manufacture (Impregnation Agents)
Pulp and Paper Manufacture (Insolublizers)
Pulp and Paper Manufacture (Solvents for de-inking paper)
Pulp and Paper Manufacture (Wet Strength Agents - Pulp and Paper)
Putty
Refuse collection processing
Re-inforced Plastics (Resin Thermoset)
Re-inforced Plastics (Resin Thermoset)
Reprographic Agents - Electrophoto. Chrge-orienting Dyes&Pigments
Reprographic Agents Diazotype Materials - Misc. Chemicals
Resin and Rubber Adhesive
Resin and rubber adhesives
Resins
Rigid Foam (Diisocyanates)
Rosin flux pyrolysis products(Electronics worker; manufacturing solder flux)
Rouge
Rubber and Plastic Manufacturing associated with diazonium salts
Rubber Gloves
Rubber Manufacture (Vulcanization agents)
Rubber products
Rug and upholstery cleaners
Scatter rugs
Sealants
Sealants. Impregnation Agents (For Fibrous Materials - Monomers)
Semiconductors – Cleaning-Semiconductors
Semiconductors (Cleaning – Semiconductors
Semiconductors Cleaning (Semiconductors
Sheet vinyl flooring
Shellac handler
Softeners (Plasticizers - Phthalates)
Softwood lumber products
Softwood plywood
Solder
Solid composite core
Solven thinned interior clear finishes
Solvent thinned exterior stains
Solvent thinned exterior undercoaters
Solvent thinned interior stains
Soot
Specialty performance sealants
Stabilizers
Standard basic hardboard (not machined or coated)
Stripping agent
Styrene-butadiene rubber sealant
Surface coatings
Synthetic resin and rubber adhesives

Tempered basic hardboard (not machined or coated)
Textile Dye
Textile dyes
Textiles (Impregnation Agents)
Thermoset overprint -resin/CAP
Thinners for dopes
Thiosulfate
Toilet bowl cleaners
Toilet soap excl medicated soaps (liquid)
Tufted carpets and rugs
Tungsten Carbide
Turpentine
Unvented gas stoves and heaters
Urethane adhesives
Used in pesticide products
Vegetable adhesives (starches)
Vegetable Gums
Vinyl coated wallcovering
Vinyl coated wallpaper
Wall coverings
Water-based hi-qual general purpose adhesives
Waterless hand cleaner
Welding and Soldering Agents (Corrosive Flux Ingredients)
Wet chemical etchants
Wet Chemical Etching
Wet Chemical Etching)
Wood furniture
Wood Office Furniture
Wood office secretarial chairs
Wood office work surfaces (modular systems)
Wood spores
Wood Stains and Varnishes (Varnish solvents)
Wood surfaces

# 3. List of Occupations and Industries Uniquely* Exposed to Substances Linked To Asthma

Compiled from lists produced by government, academic, and third-party sources

Adhesive industry
Agriculture
Aircraft Filter Manufacturing
Animal Handler
Animal handling and processing
Animal processing
Apple Growers
Artificial Fingernail Application
Assembly Line Worker
Autobody Repair
Automobile Painting
Baker
Boat manufacturing
Brewery
Brewery/Brewing Industry
Cable jointer
Candy Making
Carpenters
Carpet Cleaner
Carpet Layerer
Ceramics Industry
Cereal seed handlers
Chemical Industry
Coffee processing
Condom Manufacturing
Cooking
Cosmetics Industry
Custodial
Custodial services
Dairy Industry
Daycare Providers
Dental Industry
Detergent Manufacturing
Detonator manufacturing
Diamond Industry
Dock workers
Dye Manufacturing
Electronics
Electronics Industry
Entomology
Enzyme Manufacturing
Epoxy resin manufacturing
Explosives manufacturing
Exterminator
Factory worker
Farmer
Floor covering material sales work
Floor varnisher
Florist
Flour handlers
Food Industry
Forensics
Foundry
Foundry mold making
Fur dyeing
Galvanizing
Grain Handling and Processing
Grinder Machine Shop
Gum manufacturing
Hair Dresser
Hard metal grinder
Healthcare Industry
Indoor Pool Lifeguards
Insect breeding
Janitorial/Cleaning
Jewelry Designer
Jewelry polishing
Laboratory workers
Lacquer handler
Laundry
Livestock
Livestock (Poultry)
Livestock handlers
Machine shop
Machinists
Manufacture of polyurethane foam
Manufacturing aircraft filters
Manufacturing bags
Manufacturing bottle caps (dust)
Manufacturing Dye & Dyeing
Manufacturing Fluorine Polymer Precursor
Manufacturing Photocopy Paper
Manufacturing polyester resin
Manufacturing polyurethane products
Mechanic
Metal Plating
Metal Shops
Metallurgy
Millers
Mining
Mold maker
Mortuary Science
Natural Rubber
Nickel Manufacturing
Nursing
Oil Industry Workers
Paint shop worker
Paint Spraying
Painter
Paper wrapper's asthma
Paper/Pulp Manufacturing
Pea Processing
Pharmaceutical Industry
Phenolic Resins Manufacturing
Photographic processing
Plastic Manufacturing
Plastic/Rubber workers
Plastics factory
Plastics Manufacturing
Plastics/Rubber workers
Plastics/Rubber workers
Plater
Platinum Manufacturing
Platinum Refinery
Polyurethane foam spraying/installing/ manufacturing
Potroom worker
Poultry Processing
Poultry workers
Prawn/Crab Processing
Printer
Printing/Lithography
Producing polyurethanes
Producing resins
PVC production worker
Resin and Foam Manufacturing
Rubber and plastic Manufacturing
Rubber Glove Manufacturing
Rubber Industry
Rubber Industry Tanning
Rubber manufacturing
Sawmill Worker
Seafood Industry
Shellac handler
Shellac handler photographer
Silkworm culturing

**Most occupations are exposed to asthmagens and asthma triggers common in the indoor and outdoor enviornments. Many asthmagens and asthma triggers noted in the compiled list are unique to the occupations above.*

Ski Manufacturer
Solder/soldering
Spray Painter
Surgical Glove Manufacturing
Tanning
Tanning Industry
Tea processing
Textile Industry
Tobacco farming and processing
Toolsetter
Toolsetter and automobile plant
Tungsten Carbide
Tungsten carbide tool manufacturing/grinding
Using adhesives
Using cleaning product
Using floor cleaner
Vegetable Gums
Venipuncture
Veterinary Medicine
Water plant
Water Treament Industry
Welder
Wood handler
Wood Industry
Woodworker
Wool dye house worker
Workers handling cereal seeds

# 4. Substances Linked to Asthma Noted for the Frequency in Which They Appear on our Reference Lists

Each appears on at least six reference lists

(2-Aminoethyl) ethanolamine
1,1'-Methylenebis (4isocyanatobenzene) MDI
4-Methylmorpholine
Azoicarbonamide (1-1' - Azobisformamide)
Chloroamine T
Chromium
Chromium Compounds
Chromium, Hexavalent
Cobalt
Colophony (Rosin)
Crab
Diazonium salt
Egg Protein
Ethanolamine (2-Aminoethanol)
Ethylenediamine (1,2-Diaminoethane)
Formaldehyde
Gluaraldehyde (aka Cidex)
Hard Metal
Hexamethylene diisocyanate (HDI)
Hydralazine
Isocyanates
Isophorone diisocyanate (IPDI)
Latex
Maleic anhydride
Methyl Methacrylate
Methyl tetrahydrophtalic anhydride
Mites
N,N-Dimethylethanolamine
Napthalene Diisocyanate
Nickel
Papain
Penicillins (Ampicillin)
Piperazine dihydrochloride
Polymethylene Polyphenyl isocyanate (PPI)
Polyvinyl Chloride
Psyllium
Spiramycin
Styrene
Toluene diisocyanate (TDI)
Triethylene Tetramine
Tungsten carbide
Wood dust

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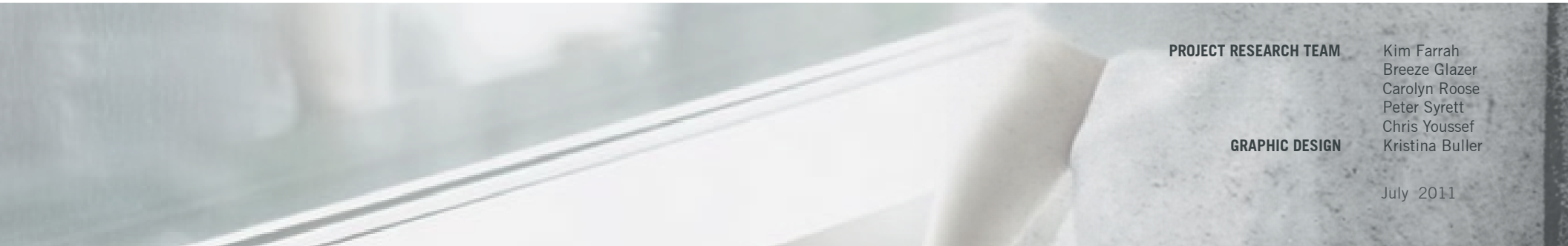

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