Allergens & Irritants

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Introduction

Asthma is one of our nation's most common chronic health conditions. Many substances can aggravate allergies or increase the severity of asthma symptoms in individuals who are sensitive to these Allergen or irritants.

This Web site is designed to help you survive the seasons by providing information on asthma, allergies and some of the most common seasonal and non-seasonal allergens and asthma irritants such as:

- Dust Mites and Cockroaches
- Pet Allergens
- Pollen
- Smoking and Vaping

Looking for Clinical Studies?
Visit the Join an NIEHS Study Website

The following clinical trials are currently recruiting

- E-Cigs and Smoking
- NHALES: Asthma Study
- RSV Infection and Asthma
- Sample Collection Registry

In addition, we provide preventive strategies for each to help you avoid exposure to these substances.

Please remember that information contained on this Web site is provided for educational and informational purposes only and should not be used to guide the diagnosis or treatment of any medical condition without the advice and supervision of a licensed, qualified health care provider.

For information on other pulmonary research performed at NIEHS, visit the Division of Intramural Research Immunity, Inflammation, and Disease Laboratory and the Division of Extramural Research and Training Translational Research sites.

General Information

- Guidelines for the Diagnosis and Management of Food Allergy in the United States

What is NIEHS Doing?

NIEHS Research Efforts

- Cross-Divisional Inflammation Faculty

Further Reading

Stories from the *Environmental Factor* (NIEHS Newsletter)

- Diverse Bacteria in House Dust Linked to Fewer Allergies in Adults (September 2020)
- Allergens Widespread in Largest Study of U.S. Homes (January 2018)
- Test Kits Can Motivate Parents to Reduce Allergens (November 2015)

Additional Resources

- American Lung Association - The American Lung Association is the leading organization working to save lives by improving lung health and preventing lung disease.
- Environmental Wellness Toolkit - What surrounds you each day in your home, work, or neighborhood and the resources available to you can affect your health. You can't always choose what's in the environments you live, work, or play in. But taking small steps to make your environments safer and limiting your exposure to potentially harmful substances can help keep you healthier.
- Food Allergy - NIAID is the lead institute at the National Institutes of Health conducting research on food allergy, a condition that affects approximately 5 percent of children and 4 percent of adults in the United States. Read on to learn more about food allergy and the steps NIAID is taking to address this growing problem.
- National Institute of Allergy and Infectious Diseases - Leading research to understand, treat, and prevent infectious, immunologic, and allergic diseases
- National Library of Medicine MedlinePlus: Allergy - A compilation of links to various resources that help with allergy treatment, diagnosis, and prevention.
- Talking to Your Doctor - Resources from NIH - You can play an active role in your health care by talking to your doctor. Clear and honest communication between you and your physician can help you both make smart choices about your health.

Content courtesy of the US Centers for Disease Control and Prevention

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Related Health Topics

- Asthma
- Lung Diseases
- Ozone

Last Reviewed: September 03, 2020

Dust Mites and Cockroaches

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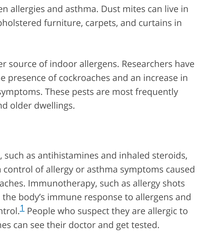
Introduction



Dust mites are microscopic, insect-like pests that commonly live in house dust. They feed on flakes of dead skin, or dander, that are shed by people and pets. These tiny creatures are a big source of allergens and can worsen allergies and asthma. Dust mites can live in mattresses, bedding, upholstered furniture, carpets, and curtains in your home.

Cockroaches are another source of indoor allergens. Researchers have found a link between the presence of cockroaches and an increase in the severity of asthma symptoms. These pests are most frequently found in urban areas and older dwellings.

Treatment

Traditional medications, such as antihistamines and inhaled steroids, may provide short-term control of allergy or asthma symptoms caused by dust mites or cockroaches. Immunotherapy, such as allergy shots and tablets, can change the body's immune response to allergens and may offer long-term control.[1] People who suspect they are allergic to dust mites or cockroaches can see their doctor and get tested.

Dust Mite Prevention Strategies

No matter how clean a home is, dust mites cannot be completely eliminated. However, the number of dust mites can be reduced by doing the following.

- Sample Collection Registry

- Use a dehumidifier or air conditioner to maintain humidity levels at, or below, 50 percent.
- Encase your mattress and pillows in dust-proof or allergen impermeable covers.
- Wash all bedding and blankets once a week in hot water, 130 to 140 degrees Fahrenheit, to kill dust mites. Non-washable bedding can be frozen overnight.
- Replace wool or feathered bedding products with synthetic materials, and traditional stuffed animals with washable ones.
- In bedrooms, replace wall-to-wall carpeting with bare floors, and remove fabric curtains and upholstered furniture, whenever possible.
- Use a damp mop or rag to remove dust. Never use a dry cloth, as it stirs up allergens.
- Use a double-layered microfilter bag or a HEPA filter in your vacuum cleaner.
- Wear a mask while vacuuming, and stay out of the vacuumed area for 20 minutes after vacuuming, to allow dust and allergens to settle.

Cockroach Prevention Strategies

- Keep food and garbage in closed, tight-lidded containers.
- Do not leave food, dirty dishes, or pet food and bowls out on countertops or floors.
- Mop the kitchen floor and wash countertops at least once a week.
- Fix leaky faucets and drain pipes.
- Fill crevices around the house through which cockroaches may enter.
- Limit the spread of food around the house, especially in bedrooms.
- Use bait stations and other environmentally safe pesticides to prevent or reduce cockroach infestation.

What is NIEHS Doing?

- Allergic and non-allergic dust mite proteins – An NIEHS study provided new information about the characteristics of dust mite proteins that may help researchers understand the development of dust mite allergy and assist in the design of better allergy therapies.[2]
- Bait traps and allergen reduction – Another NIEHS-funded study found the strategic placement of bait traps in homes resulted in sustained cockroach elimination and improved asthma outcomes.[3]
- Dust Mite reduction study – A study by NIEHS researchers found that test kits, along with education, may help reduce dust mite allergen levels in homes.[4]
- Prenatal exposure and childhood allergies – Researchers, funded by NIEHS, discovered prenatal exposure to cockroach allergen increased risk of childhood allergies.[5]

Further Reading

Stories from the *Environmental Factor* (NIEHS Newsletter)

- Allergens widespread in largest study of U.S. homes (January 2018)
- New gene related to asthma severity (November 2017)
- Dust mite proteins that cause allergies are more stable, more abundant (November 2016)
- Test kits can motivate parents to reduce allergens (November 2015)

Press Releases

- In-House Test Kits Help Motivate Parents to Reduce Allergens in Their Homes
- NIH Study Determines Key Differences Between Allergic and Non-allergic Dust Mite Proteins

Additional Resources

- Cockroaches – Information from the American Lung Association
- Dust Mites – Information from the American Lung Association

For Educators

Lesson Plans

- *Cockroaches* from Pest World for Kids
- *Cockroach Teacher Resources* from Lesson Planet
- *Dust Mites* from Pest World for Kids

Last Reviewed: September 10, 2019

Pet Allergens

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Introduction

Millions of Americans live with pets despite being allergic to them. Any furry animal, most commonly cats and dogs, may trigger allergy symptoms like sneezing or red, itchy eyes. Pet allergies can also make asthma harder to control.

You may think animal allergies are caused by fur, but that fuzz and fluff is merely a carrier for allergens.[1] Pet dander, the source of allergens, is composed of tiny, even microscopic, proteins from flecks of skin shed by pets.

- **Cat allergens** are found in cat saliva, which sticks to fur when cats lick themselves. They are also released by glands in the skin and shed as dander or secreted in the urine of male cats. The allergens are buoyant, which means they easily remain airborne.
- **Dog allergens** are also present in dander, as well as saliva, urine, and blood. Although allergen levels can differ among breeds,[2] all breeds, even hairless dogs, can trigger allergies.

Pet allergens are easily spread. They can circulate in air and remain on carpets and furniture for months. These small particles may also be carried on clothing into areas where there are no pets.

Preventive Strategies

If you suspect you or a loved one is allergic to a pet, you can get tested.

Reducing exposure to pet-related allergens, and the following may help:

- Keep pets out of the bedroom where an allergic person sleeps
- Encase mattresses and pillows in special allergen-proof fabric covers
- Remove or replace carpets
- Vacuum regularly, but when the person with allergies is not present, using a cleaner with a HEPA filter (high-efficiency particulate air, which is a type of mechanical air filter) or a double-layered micro filter bag
- Use a portable air cleaner with a HEPA filter for the allergic person's bedroom
- Avoid certain ionic air cleaners that can generate harmful ozone
- Keep pets off furniture and out of cars
- Bathe dogs, which may decrease allergens if done at least twice a week for effectiveness
- After playing with your pet, wash your hands and clothes to remove pet allergens
- Avoid contact with soiled litter
- Dust often with a damp cloth

Fact Sheets

(226KB)

Asthma and Its Environmental Triggers

What is NIEHS Doing?

Pet allergens in homes – Scientists at NIEHS found that more than 50% of households have a dog, cat, or both.[3] Nationwide studies showed dog and cat allergens were present in almost all U.S. homes, even those without pets.[4]

Endotoxins and pets – NIEHS scientists determined that people who have more contact with house-dust endotoxins, particles created when bacteria die and disintegrate, may wheeze more. These people are more likely to be younger, have lower family income and Hispanic ethnicity, live with dogs, cats, or smokers, and have cockroaches and carpeted floors in the home.[7] Another NIEHS study showed that pet allergens along with endotoxins in a home could make wheezing and asthma worse.[8]

Age and allergens – The effects of allergens on children may depend on age. NIEHS-funded researchers found that inner-city children who had more contact with specific allergens and bacteria before age 1 were less likely to have wheezing and allergy symptoms when they were older.[9] This finding suggests such early-life exposure may help build a defense to the body against developing wheezing and allergic diseases.

Further Reading

Stories from the *Environmental Factor* (NIEHS Newsletter)

- Allergens Widespread in Largest Study of U.S. Homes (January 2018)
- May is Asthma Awareness Month and NIEHS Highlights Research (May 2016)

Additional Resources

- Common Asthma Triggers - CDC's Asthma Web site provides information on how to avoid common asthma triggers.
- Immunoglobins: Testing for Allergies - An immunoglobulin (IgA, IgE, IgG, IgM) test measures the level of certain immunoglobulins, or antibodies, in the blood.
- Pet Allergy: Are You Allergic to Dogs or Cats? - Allergies to pets with fur are common, especially among people who have other allergies or asthma.
- What Is Pet Dander? - Pet dander is composed of tiny, even microscopic, flecks of skin shed by cats, dogs, rodents, birds and other animals with fur and feathers.

Related Health Topics

- Allergens & Irritants
- Asthma
- Children's Health
- Lung Diseases

File Assistance: Downloads for viewing files

Adobe Reader

Last Reviewed: May 30, 2019

Pollen

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Introduction

To a tree or a flowering plant, pollen is necessary for life. But to millions of Americans, it is a source of seasonal misery.

Pollen, a fine to coarse powdery substance, is created by certain plants as part of their reproduction process. It can appear from trees in the spring, grasses in the summer, and weeds in the fall.

Pollen in the air can trigger sneezing, congestion, watery eyes, and other cold-like symptoms. Seasonal allergies – also known as allergic rhinitis or hay fever – may affect nearly one in six Americans.[1]

Research suggests that weather changes can affect allergy symptoms. Extreme weather events, such as heat waves and thunderstorms, have been associated with outbreaks of allergic asthma, especially in patients suffering from pollen allergy.[2]

Join an asthma study!

The goal of the National History of Asthma with Longitudinal Environmental Sampling (NHALES) study is to help scientists understand how bacteria and other factors in the environment affect people who have moderate to severe asthma.

Who can participate?

- Moderate to severe asthmatics.
- Males and females, aged 18-60.
- Females should not be pregnant or breastfeeding at the start of the study, but may still participate if they become pregnant during the study.
- Nonsmokers who are also not around significant amounts of secondhand smoke.
- No history of chronic obstructive pulmonary disease, emphysema, cystic fibrosis (CF), pulmonary fibrosis, non-CF bronchiectasis, sarcoidosis, unstable angina, or pulmonary hypertension.
- Not allergic to methacholine.
- Able to provide your own transportation to clinic visits on the NIEHS campus in North Carolina.

For more information about this study:

NHALES Asthma Study
Tel 855-MYNIEHS (855-696-4347)
nhales@mail.nih.gov

FDA-approved allergy treatments are available for children and adults. Common antihistamines and nasal steroid sprays can reduce hay fever symptoms. Scientists are also trying to design nasal filters that can screen out pollen without getting in the way of natural breathing.[3]

What is NIEHS Doing?

In recent years, NIEHS-funded studies have explored the effects of a changing climate on the production of pollen.

- **Higher pollen counts** – Changes in climate may result in higher pollen counts. The annual average of daily airborne pollen amounts increased 46% between 1994-2000 and 2001-2010.[4]
- **Longer pollen season** – A warming climate lengthened the pollen season by as much as 13 to 27 days in the northern United States between 1995 and 2009.[5]
- **More hay fever** – Nationally representative data from the National Health Interview Survey indicated that exposure to extreme heat events is associated with increased prevalence of hay fever in U.S. adults.[6]
- **Increased health care usage** – Higher pollen counts are related to allergy and asthma symptoms, as measured by over-the-counter allergy medication use and emergency-department and physician-office visits for allergic disease.[2]

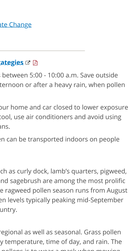
Further Reading

Stories from the *Environmental Factor* (NIEHS Newsletter)

- Quantifying Human Exposures (February 2018)
- Distinguished Lecture Examines the Rise of Allergic Disease (November 2014)
- President's Task Force Considers Climate Change and Children's Health (August 2014)
- Students Confront the Human Health Effects of Climate Change (February 2011)
- Study Confirms Link Between Environmental Exposure and Allergy (May 2010)

Stories from *Environmental Health Perspectives* (EHP)

- Climate Change and Future Pollen Allergy in Europe
- Pollen Overload: Seasonal Allergies in a Changing Climate



Additional Resources

- Allergy Relief for Your Child - U.S. Food & Drug Administration guide on how to avoid and treat common allergies.
- Children's Health in a Changing Climate - The impacts of a changing climate, from more extreme weather events to changes in seasonal patterns, have consequences for our health.
- Climate Change Indicators: Ragweed Pollen Season - This indicator provided by the United States Environmental Protection Agency (EPA) depicts changes in the legend of ragweed pollen season in the United States and Canada.
- Seasonal Allergies: Which Medication is Right for You? - U.S. Food & Drug Administration guide on allergy medications.

For more information on pollen:
800-9-POLLEN or 800-976-5536

Related Health Topics

- Allergens & Irritants
- Asthma
- Climate Change

Research Links

- Health Impacts of Climate Change

For Educators

- ***Allergy Prevention Strategies***
  - Avoid the outdoors between 5:00 - 10:00 a.m. Save outside activities for late afternoon or after a heavy rain, when pollen levels are lower.
  - Keep windows in your home and car closed to lower exposure to pollen. To keep cool, use air conditioners and avoid using window and attic fans.
  - Be aware that pollen can be transported indoors on people and pets.
- **Ragweed Pollen**
  Ragweed and weeds such as curly dock, lamb's quarters, pigweed, plantain, sheep sorrel and sagebrush are among the most prolific producers of pollen. The ragweed pollen season runs from August to November, with pollen levels typically peaking mid-September in many areas in the country.
- **Grass Pollen**
  Grass pollen types are regional as well as seasonal. Grass pollen levels can be affected by temperature, time of day, and rain. The best way to avoid grass pollens is to wear a mask when mowing your lawn or ask someone else to mow it. Be sure to keep grass cut short or consider an alternative ground cover that doesn't produce much pollen, such as Irish moss, bunch, and dichondra.

  More than 1000 species of grass grow in North America, but only a few cause allergies. The most common species associated with allergies are:
  - Bermuda grass
  - Johnson grass
  - Kentucky bluegrass
  - Orchard grass
  - Sweet vernal grass
  - Timothy grass
- **Tree Pollen**
  Trees release their pollen as early as January in the Southern states and as late as May or June in the Northern states. Tree pollen can be distributed miles away from the original source.

  When choosing trees for your yard, look for species that are less likely to cause allergic reactions, such as:
  - Crape myrtle
  - Dogwood
  - Fig
  - Fir
  - Pear
  - Plum
  - Redbud
  - Redwood
  - Female cultivars of ash, box elder, cottonwood, maple, palm, poplar, or willow tree

  People with tree pollen allergies should avoid the following trees:
  - Catalpa
  - Elm
  - Hickory
  - Oak
  - Pecan
  - Sycamore
  - Walnut

Last Reviewed: May 30, 2019

Smoking and Vaping

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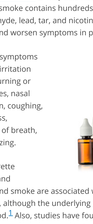
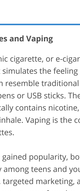


The link between cigarette smoke and disease, particularly lung cancer and cardiovascular disease, is well known. Cigarette smoking is the leading cause of preventable death in the United States.

Secondhand smoke may also have health effects for those exposed. Cigarette smoke contains hundreds of chemicals, including formaldehyde, lead, tar, and nicotine. Many of these chemicals act as irritants and worsen symptoms in people with asthma and allergies.



Common symptoms of smoke irritation include burning or watery eyes, nasal congestion, coughing, hoarseness, shortness of breath, and wheezing.

Both cigarette smoking and secondhand smoke are associated with chronic hay fever and sinus infections, although the underlying reason is not completely understood.[1] Also, studies have found that smoking decreases the effectiveness of inhalers used to treat asthma.[2]

Children can be especially vulnerable to environmental irritants, such as cigarette smoke. According to the Centers for Disease Control and Prevention, more than 20 percent of children will suffer a respiratory, food, or skin allergy before they turn 18.[3] Cigarette smoke may also promote autoimmune diseases, which are caused by the body's immune system attacking healthy cells.[4] Studies have shown cigarette smoke to be a risk factor in the development of rheumatoid arthritis, an autoimmune disease that affects joints.[5]

E-Cigarettes and Vaping

An electronic cigarette, or e-cigarette, is a handheld electronic device that simulates the feeling of traditional tobacco smoking. Devices can resemble traditional cigarettes, cigars, or pipes, or items like pens or USB sticks. They work by heating a liquid, which typically contains nicotine, to generate an aerosol or vapor that users inhale. Vaping is the commonly used term for the use of e-cigarettes.

Vaping has gained popularity, both in the U.S. and worldwide, particularly among teens and young adults, due to easy availability, targeted marketing, and creative e-liquid flavors. While e-cigarettes are often thought to be safer than tobacco cigarettes, little is known regarding the health effects of their use. Scientists at NIEHS are conducting the E-Cigs and Smoking Study, to develop new biomarkers, or measurable indicators of a normal or abnormal process or condition or disease, of tobacco smoke exposure or e-cigarette use.

What is NIEHS Doing?

Looking for Clinical Studies?
Visit the Join an NIEHS Study Website

The following clinical trials are currently recruiting

- E-Cigs.and.Smoking

Chemicals in cigarette smoke – An NIEHS-funded study revealed that acrolein, a substance that is abundant in cigarette smoke, irritates airways by creating free radicals, unstable molecules that can damage cells.[6]

Menthol and smoking – Research funded by NIEHS found that menthol suppresses respiratory irritation in mice, suggesting that its addition to cigarettes may facilitate smoke inhalation and promote nicotine addiction and smoking-related illness in humans.[7]

Your genes and smoking – A study including NIEHS scientists found that smoking can influence which genes are turned on or off. The new findings may provide researchers with potential targets for new therapies.[8]

E-cigarettes and transition to traditional smoking – NIEHS-funded researchers found that use of e-cigarettes with higher nicotine concentrations by youth may increase the subsequent frequency and intensity of traditional cigarette smoking and vaping.[9]

Cigarette smoking and fertility – NIEHS-funded researchers discovered cigarette smoking is linked to sperm abnormalities that may limit men's fertility. They found smokers had lower sperm volume and total sperm count, as well as increased sperm motility.[10]

Further Reading

Stories from the *Environmental Factor* (NIEHS Newsletter)

- High school scientist at NIEHS-funded program wins big (May 2018)
- Two new studies need volunteers – puberty, e-cigs and smokers (February 2016)

Self Help

- American Cancer Society 800-ACS-2345 (800-227-2345)
- American Lung Association 800-LUNG-USA (800-586-4669)
- Centers for Disease Control 800-CDC-1311 (800-232-1311)
- Español Smoke Free 877-44U-QUIT (877-448-7848)
- National Cancer Institute 800-QUIT-NOW (800-784-8669)
- Nicotine Anonymous 415-750-0328

Additional Resources

- Health Risks of Secondhand Smoke – Information from the American Cancer Society
- Respiratory Effects in Adults from Exposure to Secondhand Smoke – Report from the U.S. Surgeon General's office
- Secondhand Smoke: Questions and Answers – Information from the National Cancer Institute
- Secondhand Tobacco Smoke and Smoke-free Homes – Information from the U.S. Environmental Protection Agency
- Smoking and the Digestive System – Information from the National Institute of Diabetes and Digestive and Kidney Diseases
- Smoking and Tobacco Use – Information from the Centers for Disease Control and Prevention
- The Facts on E-Cigarette Use Among Youth and Young Adults – Information from the U.S. Surgeon General
- The Health Consequences of Smoking—50 Years of Progress: A Report of the Surgeon General – Information from the U.S. Surgeon General

Related Health Topics

- Acrylamide
- Formaldehyde

Last Reviewed: July 01, 2019