

Children are at greater risk of developing asthma than adults; over 2.5 million children under age 18 suffer from allergic asthma.

## Asthma

### **What Is Asthma?**

Asthma is a chronic (long-term) lung disease that inflames and narrows the airways, causing respiratory symptoms such as coughing, wheezing, and shortness of breath. Immunologists and allergists have identified two broad categories of asthma: an allergic and a non-allergic form.

Asthma is a significant public-health problem in the United States. Although treatments are well developed and available, there are many untreated cases and patients with poorly controlled symptoms. For these reasons, asthma leads to nearly 500,000 hospital stays each year.

### **What Causes Asthma?**

Despite the far-reaching effects of asthma, much remains to be learned about its causes. The most common form, allergic asthma, has causes on more than one level. The root cause is an autoimmune response in which the immune system, for genetically based reasons, responds to certain allergens as to invaders. Through a complex reaction, cells in the small airways of the lungs release chemicals that cause the airways to contract. Specifically, the reaction begins when an asthmatically susceptible person encounters an allergen for the first time and becomes sensitive to it. In becoming sensitive, the immune system, acting through white blood cells, produces immunoglobulin E [IgE] antibodies and releases them into the bloodstream. They

attach to special cells, called mast cells that reside in the linings of the small airways of the lungs. As with other allergies, the first exposure to an allergen may not produce symptoms. However, each time that the affected person inhales an asthmatic allergen, the sensitized mast cells release chemical alarms that cause the small airways of the lungs to contract. These contractions, and accompanying inflammation, make breathing difficult.

On another level, allergic asthma results from the particular “triggers” or stimuli that set off the autoimmune response. The following stimuli can cause asthma attacks:

- ❖ Cigarette smoke
- ❖ Dust mites
- ❖ Humidity
- ❖ Animal dander
- ❖ Cockroaches
- ❖ Household dust
- ❖ Indoor mold
- ❖ Cold air
- ❖ Aerosols that can be inhaled
- ❖ Cockroaches
- ❖ Sulfites in foods

Non-allergic asthma also causes coughing and respiratory disruptions. However, this form of asthma does not involve the immune system and entails irritants that are not allergens, such as anxiety, stress, exercise, cold air, and smoke.

### **Who Is at Risk of Asthma?**

You or your child is at added risk of developing allergic asthma if there is an existing allergic condition or if you have a family history of asthma or allergies. In addition, children are at greater risk of developing asthma than adults; over 2.5 million children under age 18 suffer from allergic asthma.

## What Are the Signs and Symptoms?

Symptoms of asthma can be seen on three levels:

### Primary Symptoms

The primary symptom of asthma is inflamed airways in the lungs. This inflammation characterizes both asthma of allergic and non-allergic origin.

### Secondary Symptoms

Airway inflammation leads to the following secondary symptoms:

- ❖ The bronchi, the airway branches leading to the lungs, become overly reactive and more sensitive to all kinds of asthma triggers such as allergens, cold and dry air, smoke and viruses.
- ❖ The lungs have airflow obstruction (difficulty moving air in and out)

### Tertiary (Third-level) Symptoms

Together, these symptoms cause the following tertiary symptoms:

- ❖ Shortness of breath
- ❖ Pain in breathing
- ❖ Difficulty exhaling
- ❖ Tightness in the chest
- ❖ Wheezing (breathing characterized by high-pitched whistling sounds)

Additional symptoms may include excessive fatigue after exertion, disturbed sleep, and difficulty recovering from colds.

## How Is Asthma Diagnosed?

The process of diagnosing asthma begins with a consultation with your doctor, an allergist, or an immunologist. During this consultation, the doctor takes your medical history and talks with you to gather information about your symptoms and family history. In addition, your doctor conducts a physical exam and may administer a test called spirometry. This test allows your doctor to assess lung function by measuring the quantity and speed of air inhaled and exhaled during a specified span of time. The

doctor may prescribe medicines and then test again for improved results. You may receive a diagnosis of asthma if your lungs respond well to asthma medicine and if your medical history includes asthma symptoms.

In addition to spirometry, your doctor may recommend the following tests:

- ❖ Chest x-ray
- ❖ Electrocardiogram (ECG)
- ❖ Allergy testing
- ❖ Bronchoprovocation test (measures sensitivity of airways)

Your doctor may also test for:

- ❖ Gastro-esophageal reflux disease (GERD)
- ❖ Vocal cord dysfunction
- ❖ Sleep apnea

## What Are Common Treatments?

To assist you in managing and predicting your symptoms, your doctor may suggest that you use a peak-flow meter. This device can be used at home to help detect subtle changes in lung capacity. If the readings are lower than usual, it is a sign that you may have an impending asthma attack. The doctor will give instructions on how to track and deal with low readings.

## Medications

Three principal types of medicines are used in treating asthma: long-term controller medications, quick-reliever medications, and combined therapy. Controller medications prevent or reverse the inflammation that causes asthma symptoms, making the airways less sensitive to triggers.

### Long-term Controller Medications

There are two groups of long-term controller medications, which are classified according to their principles of operation: the anti-inflammatory group and the long-acting bronchodilator group. The anti-inflammatory medicines intercept the chain of events that

causes the autoimmune inflammatory symptoms. Examples include Cromolyn® and Nedocromil®, which help to prevent inflammation and which can be used to treat asthma of mild severity. These preventive medications reduce symptoms greatly after a week of use. However, your doctor may prescribe them for longer use to achieve the maximum benefit. Cromolyn and Nedocromil are inhalants that are taken by way of a bronchodilator.

Other anti-inflammatory medications include the following orally administered tablets:

- ❖ Steroid tablets: Steroids such as prednisolone are effective in preventing or reducing inflammation in the airways. A short (seven-day) course of steroid is likely to provide relief without causing major or long-term side effects. Steroids work by reducing inflammation in the airways. However, steroids require seven to 14 days to take effect. For this reason, another, supplementary medication may be required for immediate relief.
- ❖ Leukotriene modifiers: These medications also help to block the autoimmune reaction that causes inflammation in allergic asthma.



In addition to these orally administered anti-inflammatory medicines, a new treatment called Anti-IgE therapy has become available. Anti-IgE therapy works by helping to reduce the production and diffusion of Immunoglobulin E (IgE), a primary trigger of allergic inflammation in the lungs. It blocks allergic asthma at its root cause. This drug is injected by your doctor on a regular basis. It does not eliminate your need for other asthma medications but it can help to reduce your use of them. Because of its significant cost, this form of therapy is currently reserved for moderate to severe cases requiring multiple medications.

### **Long-acting Bronchodilator Medications**

Medications in this group do not reduce inflammation, but they open the airways for long periods. While not fulfilling the function of anti-inflammatory asthma medication, long-acting bronchodilators can provide substantial, long-lasting relief of symptoms. Some of these medications are inhaled; others are taken as tablets.

Long-acting beta agonists (inhaled) can be taken with or without an anti-inflammatory medicine to help control daily symptoms, including nighttime asthma. This type of medicine can also prevent asthma triggered by exercise. Because long-acting beta agonists cannot relieve symptoms quickly, they should not be used for acute attacks. These medications should be accompanied by a short-acting, inhaled beta agonist to relieve acute symptoms. Beta agonists likewise do not fulfill the function of anti-inflammatory medicine: You should not decrease or stop taking your anti-inflammatory medicine without talking to your doctor, even if you feel better.

### **Quick Reliever Medications**

Quick reliever medicines in any of the following forms can ease the coughing and other symptoms that occur during asthma episodes:

- ❖ Short-acting bronchodilators (inhaled) are one type of quick reliever medicines. They open airways by relaxing muscles that tighten in and around the airways during asthma episodes.
- ❖ Short-acting beta agonists (inhaled) relieve asthma symptoms quickly and some prevent asthma caused by exercise. If you use one of these medicines every day, or if you use it more than three times in a single day, your asthma may be getting worse, or you may not be using your inhaler correctly. Talk with your doctor right away about adding or increasing a medication, and about your inhaler technique.
- ❖ Oral beta agonists (syrup, tablets and long-acting tablets) may be used for children, while long-acting tablets may be used for nighttime asthma. Oral preparations usually cause more side effects than the inhaled form.

### **Combined-therapy Medication**

- ❖ Combined therapy medicine is an inhalant that contains both a controller and reliever medicine. This combination of a long-acting bronchodilator and a corticosteroid is used for long-term control.

## Can Asthma Be Prevented?

The autoimmune causes of allergic asthma cannot be prevented. However, you can prevent or reduce your experience of asthma attacks by avoiding such allergens and other irritants as these:

- ❖ Cigarette smoke: If you smoke, ask your doctor to help you quit smoking.
- ❖ Ask family members to stop smoking and do not allow smoking in your home, or car. If possible, ensure that no one smokes in places frequented by family members, such as at a child's daycare center or school.
- ❖ Dust mites: Dust mites are tiny insects that live in cloth and carpets. Encase mattresses and pillowcases in special dust-mite proof covers. Wash bed linens frequently in water hotter than 130°F to kill the mites. If possible, remove carpets.
- ❖ Indoor humidity: Reduce indoor humidity to 60 percent or below; ideally, to between 30 and 50 percent. For this purpose, consider getting a dehumidifier or a central air conditioner
- ❖ Animal dander: Keep pets with fur or hair out of the home. If you have an indoor pet that cannot be kept outdoors, keep it out of the affected person's bedroom.
- ❖ Cockroaches: Keep all food out of your bedroom. Ensure proper food storage in tight containers. To kill cockroaches yourself, use poison or boric acid. Be sure to ventilate the room well if you use poison or any spray.
- ❖ Vacuum cleaning: Get someone else to vacuum for you and avoid the vacuuming process. If you must vacuum, use a dust mask, a central cleaner with the collecting bag outside the home, or a vacuum cleaner with a HEPA filter or a double-layered bag.
- ❖ Indoor mold: Fix leaking faucets, pipes, or other sources of water. Clean moldy surfaces. Dehumidify basements.
- ❖ Smoke, strong odors, and sprays: Do not use a wood-burning stove, kerosene heater, fireplace, unvented gas stove, or unvented heater unless it is electric. Avoid strong odors and sprays, such as perfume, talcum powder, hair spray, paints, and particle board.
- ❖ Exercise and sports: Remain as active as you can as long as symptoms do not appear. Take medicine before you exercise; begin exercise periods with warm-ups.

- ❖ Air quality: Check the air quality index and try not to work or play hard outside when the air pollution or pollen levels are high.
- ❖ Sulfites in foods: Do not drink beer or wine or eat shrimp, dried fruit, or processed potatoes if they cause asthma symptoms.
- ❖ Cold air: Cover nose and mouth with a scarf on cold or windy days.

### Should I Call My Doctor?

Whether or not you have been diagnosed with asthma, seek emergency medical assistance, if you have any of the following symptoms:

- ❖ Blue or gray tints in your lips and/or fingernails
- ❖ Worsening symptoms over the span of a few hours
- ❖ Shortness of breath that prevents you from extended speech (for example, you cannot say a short sentence)

If you have been diagnosed with asthma, seek emergency medical assistance if you have any of the following problems:

- ❖ Extreme shortness of breath and inability to do routine activities, even after taking quick-reliever medicines
- ❖ Unimproved symptoms after 24 hours' dose of your prescribed controller drugs
- ❖ A significant and sustained drop in your peak flow numbers (indicating lung-volume capacity) even after you have taken your prescribed medication

If you have been diagnosed with asthma, make an appointment with your doctor promptly if you are in any of these circumstances:

- ❖ Uncertain how to take your medicines
- ❖ Coughing mucus
- ❖ Unable to sleep because of wheezing and/or coughing
- ❖ Short of breath more often than before
- ❖ Breathing faster than usual

In addition, make an appointment with your doctor if your peak-flow volumes fall below 80 percent of their usual values.

**For More Information**

For more information, refer to the following medical resources:

<http://www.nlm.nih.gov/medlineplus/asthma.html>

<http://www.aaaai.org/home.aspx>

<http://www.aafa.org/display.cfm?id=8>

The content in this document is neither intended nor recommended as a substitute for seeking professional medical advice, diagnosis or treatment. It is recommended that you seek the advice of your physician or other qualified healthcare professional regarding any medical questions related to the topics contained within this document, your health or conditions.