



# Asthma



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CAPITAL ALLERGY & RESPIRATORY DISEASE CENTER  
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## *What Is Asthma?*

Asthma is a condition of the lungs characterized by inflammation and narrowing of the airways. In severe cases, this narrowing is irreversible and can contribute to airway remodeling, and thus, reduced lung function. Airway narrowing occurs due to airway hyperreactivity to an irritant that prompts constriction of the smooth muscles surrounding the airways. Secretion of mucus into the airways and inflammation of the airway lining cause wheezing, shortness of breath, cough, and chest tightness.

Asthma is very common (1 in 4 persons have a history of wheezing). It is often associated with hay fever, eczema, or a family history of asthma or allergy. Most children have fewer and less severe attacks as they grow older. In some cases, there is no permanent damage to the lungs. In other cases, airway remodeling can occur which reduces lung function. It is not known whether airway remodeling can be reversed.

## *What Contributes to Asthma?*

Contributors to recurrent airway narrowing include:

1. Allergy – over 70% of people with asthma have allergies.
2. Infections – viral infections are the major trigger of acute asthma in children, especially young children.
3. Changes in temperature, humidity, or barometric pressure
4. Irritants such as cigarette smoke, air pollution, dust, and chemical odors
5. Exercise – Proventil® (albuterol) is often given before exercise to prevent exercise-induced narrowing of the airways.
6. Emotional upset
7. Gastroesophageal reflux disease
8. Sinusitis



### *What Tests Are Done?*

Pulmonary function tests are needed to determine the extent of airway narrowing or obstruction. Skin tests may also be needed to determine which allergens may be causing wheezing. Children usually have to be 4 or 5 years of age in order to cooperate in pulmonary function tests. Pulmonary function tests help us to determine response to medication and also to judge the severity of asthma. These are invaluable tools in regulating medication.

### *What Do I Do for an Asthma Attack?*

In the event of an asthma attack, including coughing, breathing hard, wheezing, and complaints of shortness of breath or tightness of the chest, you should take the following steps:

1. Stay calm and quiet.
2. Take slow, deep breaths and exhale very slowly.
3. Use fast-acting bronchodilator medication via inhaler or nebulizer at intervals that have been prescribed.
4. Call us if problems do not ease.
5. Patients with asthma should use aspirin with caution for fever as this may aggravate the symptoms in some patients. Tylenol<sup>®</sup> or Datril<sup>®</sup> (acetaminophen) should be used in the appropriate dose for the patient.

### *What Are the Treatments for Asthma?*

Since asthma has no cure, the aim of treatment is to control symptoms of the disease and to normalize lung function so that the patient can lead a full life. When a particular substance or situation is known to bring on an attack, it should be avoided. Medication should be taken before exercise to prevent exercise-induced asthma if this is a problem. The treatment of asthma may include a variety of medications taken by injection, by inhalation or nebulization, or orally. Several medications may be tried before the right combination and dosage of medication is determined for each individual.



The medications used to treat asthma include:

- I. Bronchodilators
  - a. Beta<sub>2</sub>-Agonists (short-acting) such as Proventil<sup>®</sup> or Ventolin<sup>®</sup> (albuterol), Alupent<sup>®</sup> (metaproterenol), Xopenex<sup>®</sup> (levalbuterol)
  - b. Beta<sub>2</sub>-Agonists (long-acting) such as Foradil<sup>®</sup> (formeterol) and Serevent<sup>®</sup> (salmeterol)
  - c. Anticholinergic Medications, such as Spiriva<sup>®</sup> (tiotropium)
  - d. Theo-Dur<sup>®</sup>, Uniphyll<sup>®</sup> (theophylline)
- II. Intal<sup>®</sup> (Cromolyn sodium)
- III. Tilade<sup>®</sup> (Nedocromil)
- IV. Corticosteroids
  - a. Oral (Prednisone, Prelone<sup>®</sup> [prednisolone syrup], Medrol<sup>®</sup> [methylprednisolone], Orapred<sup>®</sup> [prednisolone oral solution])
  - b. Inhaled (Qvar<sup>®</sup> [beclomethasone], Asmanex<sup>®</sup> [mometasone], Azmacort<sup>®</sup> [triamcinolone], Flovent<sup>®</sup> [fluticasone], Pulmicort<sup>®</sup> [budesonide])
- V. Combination Inhalers (Advair<sup>®</sup> [fluticasone and salmeterol], Symbicort<sup>®</sup> [budesonide and formoterol])
- VI. Leukotriene Modifiers (Singulair<sup>®</sup> [montelukast], Accolate<sup>®</sup> [zafirlukast], Zflo<sup>®</sup> [zileuton])
- VII. Anti-IgE Monoclonal Antibodies (Xolair<sup>®</sup> [omalizumab])
- VIII. Nebulized Medications (bronchodilators such as Xopenex<sup>®</sup> [levalbuterol], and corticosteroids such as Pulmicort<sup>®</sup> [budesonide])

## ***Bronchodilators***

### **a. Short-Acting Beta<sub>2</sub>-Agonists**

Beta<sub>2</sub>-agonists are given to relax airway smooth muscle. The drugs may be given by mouth, injection, or most commonly via inhalation.



Short-acting beta<sub>2</sub>-agonists are used on an as-needed basis when symptoms flare up. However, overuse of these agents could be a sign of worsening asthma. Therefore, consult your physician if you find yourself using these medications more than you usually do. Adverse effects that may occur include nervousness, rapid heart rate, and muscle tremor. Adverse effects are usually dose-related and may be minimized with dosage adjustments. Overuse can cause irregularities in the heartbeat. These drugs are most effective when given via inhalation and when given as needed.

### b. Long-Acting Beta<sub>2</sub>-Agonists

These drugs are not indicated in the treatment of an acute attack of asthma and must be taken on a daily basis to be effective. They prevent inflammation and thus, asthma attacks. Unlike short-acting beta<sub>2</sub>-agonists, which are taken on an as-needed basis, the long-acting agents are taken for a specified number of times daily. Both short-and long-acting beta<sub>2</sub>-agonists may be helpful in preventing exercise-induced asthma.

### c. Anticholinergic Agents

These drugs may be helpful in some asthma patients but are more commonly used in chronic obstructive pulmonary disease (COPD). These drugs may be combined with a beta<sub>2</sub>-agonist.

### d. Theophylline

Theophylline relaxes smooth muscles around the airways and thereby relieves airway constriction. Depending on the frequency and severity of symptoms, theophylline may be taken either regularly or intermittently. It is often combined with beta<sub>2</sub>-agonist medications to relieve asthma symptoms. Adverse effects include nervousness, headache, irritability, palpitations, nausea, and vomiting. These symptoms may be decreased by taking medications with a snack and usually go away or lessen after the drug is taken for several days. If adverse effects do not abate, it may be necessary to adjust the dosage of the drug in order to avoid the adverse effects. It is possible, and often it is valuable, to measure the level of theophylline in the blood in order to maximize the benefit and minimize the chance for adverse effects of the drug. If symptoms cannot be controlled with prescribed frequency of use, it is important to contact the care provider for adjustment of therapy.



### *Intal<sup>®</sup> (Cromolyn sodium)/Tilade<sup>®</sup> (Nedocromil)*

These are nonsteroidal inhaled drugs that are used to prevent wheezing by blocking the allergic reaction. They have no value in the treatment of an acute attack of asthma and must be taken on a daily basis to be effective. Both drugs may be helpful in preventing exercise-induced asthma.

### *Corticosteroids*

#### *a. Oral Corticosteroids (Prednisone, Prelone<sup>®</sup>, Medrol<sup>®</sup>, Orapred<sup>®</sup>)*

Corticosteroids work to decrease airway swelling and inflammation and to improve the response to bronchodilator medications. Corticosteroids are the most effective yet most feared and misunderstood of asthma medications. Actually, hydrocortisone is a natural anti-inflammatory steroid hormone that is made daily by the body's adrenal glands. Corticosteroid drugs given orally are simply more potent and longer-lasting modified versions of hydrocortisone. Problems only occur when large doses are administered daily over many weeks. A one-week course of prednisone is generally safe. Prednisone taken every other morning is another effective and safer method of controlling severe asthma in patients. However, this must be done with careful physician supervision.

#### *b. Inhaled Corticosteroids (Qvar<sup>®</sup>, Asmanex<sup>®</sup>, Flovent<sup>®</sup>, Pulmicort<sup>®</sup>)*

These are administered directly into the airways by inhalation. The aerosol works topically to reduce airway swelling and stabilize the airway. During acute attacks, prednisone may be temporarily substituted for the inhaled corticosteroid. The mouth must be rinsed after using inhaled corticosteroids to prevent local oral infections and to decrease systemic absorption. These medications are routinely favored over their oral counterparts due to enhanced local beneficial effects in the lung and reduced systemic adverse effects.

### *Combination Inhalers (Advair<sup>®</sup>, Symbicort<sup>®</sup>)*

Combination inhalers prevent 2 facets of asthma: airway inflammation and constriction. Thus, they contain a corticosteroid and a bronchodilator medication. These are controller medications, and so must be taken at a set time every day.



### *Leukotriene Modifiers (Singulair<sup>®</sup>, Accolate<sup>®</sup>, Zyflo<sup>®</sup>)*

This class of drugs blocks the effect of leukotriene mediators which cause both airway inflammation and bronchospasm. There are 2 types: those which block leukotriene receptors and those which inhibit the synthesis of leukotrienes. These medications are given orally. Asthmatics who experience symptoms with cold air exposure, exercise, and aspirin may be helped with this class of drugs.

### *Anti-IgE Drugs (Xolair<sup>®</sup>)*

Xolair<sup>®</sup> (omalizumab) is an injection used for the prevention of asthma attacks and symptoms of allergic asthma in patients with moderate to severe persistent disease. The drug works by blocking immunoglobulin E (IgE)—which the body over-expresses when exposed to allergens. Xolair<sup>®</sup> is for patients age 12 and older with allergic asthma and elevated IgE levels, who continue to have symptoms despite taking inhaled corticosteroids. Adverse effects may include anaphylaxis, injection-site reactions, upper respiratory tract infections, and sore throat.

### *Nebulized Medications*

A nebulizer or “breathing machine” is a device that uses compressed air to create a mist form of asthma medication to inhale. The mist is delivered to the lungs with a face mask. The medication is inhaled for 5 to 15 minutes. Nebulizers are a good option for children or for adults who have difficulty using inhalers.

Although asthma is not a “curable” disease, it can be controlled with an appropriate medication program and with specific allergy therapy when indicated. Do not hesitate to ask other questions you might have, because it is only with a complete understanding of asthma that a treatment program will be most effective.

### *Tips for Using Inhalers*

A metered dose inhaler consists of a pressurized canister of medication and a mouthpiece. Pressing on the inhaler releases a mist of medication that you inhale into your lungs. It is often used with a spacer to hold the mist, which makes it easier to inhale. Without a spacer, it is best to hold the inhaler 1 to 2 inches away from your mouth during inhalation. However,



wrapping your lips around the mouthpiece is an option, too.

A dry powder inhaler requires you to load a device with a capsule of medication. When the device is pressed, the capsule is converted into a dry powder that you inhale into your lungs. Unlike the metered dose inhaler, you must tightly wrap your mouth around the mouthpiece to ensure that most of the powder enters your lungs. Below are some tips for using inhalers:

1. Start slow inhalation after a normal breath is finished.
2. A holding chamber or spacing device should be used with a metered dose inhaler to improve drug delivery.
3. Breathe and hold for 10 seconds after inhalation to allow for better airway deposition of the drug.
4. If multiple inhalers are used, the bronchodilator inhaler should be used first.
5. It is advisable to rinse your mouth or brush your teeth after each use, especially if you are using a corticosteroid.

### *Peak Flow Meter*

Use of a peak flow meter to monitor lung function at home can be a very important tool for adjustment of your medication, monitoring your progress, and providing you with an “early warning” system so you know when to contact your doctor for help. Changes in your lung function (peak flow) reading can indicate the early onset of asthma problems and can help guide you and your healthcare provider in your optimal asthma care plan.