

Living Well With

# ASTHMA

## CHEST

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chestnet.org

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## WHAT IS ASTHMA?

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Asthma is a lung disease that causes the airways to narrow, making it hard to breathe. Asthma is a chronic condition, meaning that once you have been diagnosed with it, you likely have it. It can resolve in some cases, especially in young boys. You can develop asthma as early as infancy and as late as old age. The good news is that with careful monitoring and management, asthma can be kept under control.

*You deserve a happy  
and fulfilling life.*

ALMOST **20 MILLION**  
AMERICAN ADULTS HAVE  
ASTHMA—**ROUGHLY 1 IN 12**

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**1 IN 10 CHILDREN** IN THE  
US HAS ASTHMA—THAT'S ALMOST  
**6 MILLION**—WITH HIGHER  
RATES AMONG BLACK CHILDREN

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**8 MILLION** ADULTS AND  
**3 MILLION** CHILDREN  
HAD AN **ASTHMA ATTACK**  
IN THE PAST YEAR

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**ASTHMA CAUSES:**  
**MORE THAN 5 MILLION**  
MISSED SCHOOL DAYS FOR  
CHILDREN EACH YEAR

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**14.2 LOST WORKDAYS**  
PER ADULT EACH YEAR

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**\$89 BILLION**  
IN ESTIMATED COSTS  
IN THE US EACH YEAR

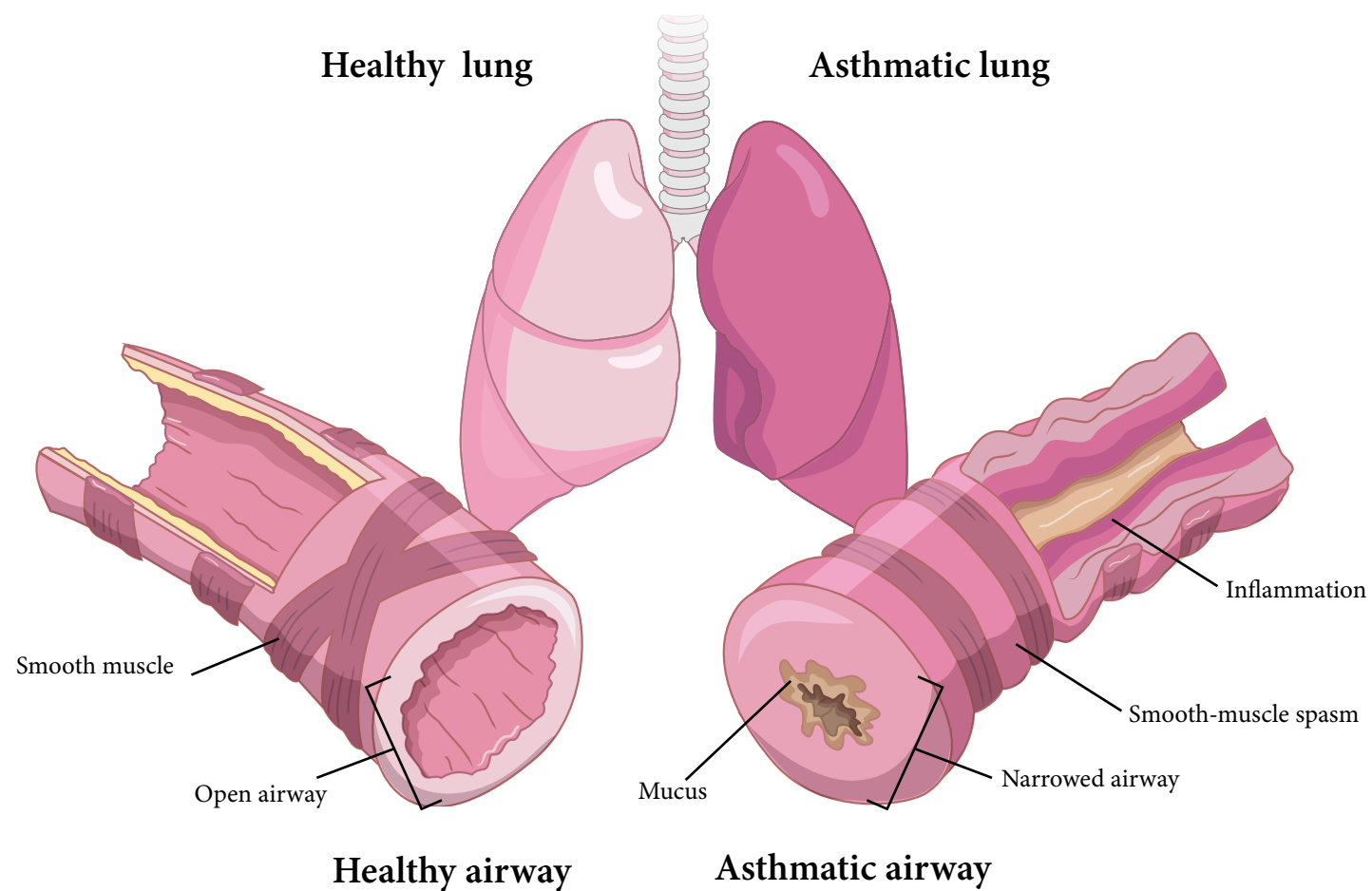


## What Happens in Your Body When You Have Asthma?

In a healthy lung, the lining of the airways is clear and open, and the muscles surrounding the airways are relaxed. This allows air to flow through freely. With asthma, inflammation in the airways makes it hard to breathe. Three things happen—often at the same time:

- The lining gets inflamed, which makes it swell and thicken. This swollen lining narrows the opening for air to flow through.
- The muscles on the outside of the airways tighten. This makes it harder to push air in and out.
- Mucus forms another layer inside the airway, which also narrows the opening.

## Healthy Lung vs Asthmatic Lung



The goal of asthma management is to find out what causes your airways to act in these ways and to put a plan of action in place that helps prevent these reactions. If uncontrolled, asthma can cause permanent scarring over time or even death, so it's important that you take action. Controlled asthma can be managed by a primary care physician, but a specialist may be needed for moderate-severe asthma symptoms.

## WHAT ARE THE SYMPTOMS OF ASTHMA?

When you have asthma, you may experience some or all of these symptoms:

- Shortness of breath
- Wheezing
- Coughing
- Chest discomfort
- Not being able to do your activities of daily living

## HOW IS ASTHMA DIAGNOSED?

These symptoms can apply to a number of different lung conditions. It is important that you find an asthma specialist for an accurate diagnosis. To determine whether you have asthma, your health-care provider will typically:



- Do a physical exam and ask about your health history and your family’s health history (family history).
- Perform a breathing test called spirometry. Spirometry tests how much air you can move in and out of your lungs and how fast you can do it. You will be asked to blow into a mouthpiece of a handheld device, called a spirometer, as fast and hard as you can a few times to calculate your lung capacity.
- In some cases, do an advanced test to show you really have asthma.

In some cases, you can have normal lung function but still have asthma. Your health-care provider can test you before and after an albuterol treatment to see if your airways improve with albuterol. In other cases, your health-care provider may need to refer you for challenge testing with methacholine, exercise, cold air, and mannitol to determine whether your symptoms are related to asthma.

During a methacholine challenge, you will be exposed to small and increasing doses of a medication called methacholine, which causes the airways to narrow. After each dose, your lung capacity will be measured using the spirometer. Once the airways narrow by 20% compared to your baseline reading, the test is completed and you are given medication to open your airways again. If further evaluation is required, particularly if your asthma is uncontrolled, your health-care provider may also recommend doing:

- Allergy testing to discover if allergens might be triggering your asthma.
- Fractional exhaled nitric oxide (FeNO) testing. This test does not specifically test for asthma, but it helps your health-care provider determine how much inflammation you have in your airways.
- Eosinophil testing to determine cell count in blood.

## ADULT-ONSET ASTHMA

*Asthma can occur at any age in life—even older than 65.*



Last year, Grace retired from her teaching career at age 65. She was looking forward to doing more travel, but in the fall, she got the flu.

Since then, she has had a cough that just won’t go away. After 6 months of struggling, she finally called her doctor and made an appointment.

Her doctor diagnosed asthma. Grace was shocked. “But I’ve never had any breathing problems. Aren’t I too old to get asthma?” Grace asked. Her doctor explained that asthma can occur at any age in life—even older than 65.

This is known as adult-onset asthma. It can be more serious than asthma in children because of other physical problems or diseases a patient may have. Adults have more complications with other medications and illnesses. Tissue within the lungs also tightens naturally as people age.

Grace’s doctor referred her to an asthma specialist. Working together, they started her on daily medications and put an Asthma Action Plan in place to make sure her asthma is under control. Now Grace travels to a new country every year.





## COMMON ASTHMA TRIGGERS AND SOLUTIONS

Anything that causes the airway to become inflamed or swollen or to tighten is called an asthma trigger. Reducing exposure to your asthma triggers is the first important step in keeping your airways open and managing your asthma.

There are a wide array of asthma triggers, ranging from infections (like a cold or flu) to irritants (such as smoke or air pollution), strenuous exercise, and even strong emotions. What is important to remember is that each person's asthma is unique. Each person reacts to different triggers.

In most cases, triggers are found in the air we breathe. For example, allergens (such as tree pollen or pet dander) can cause an allergic reaction that increases inflammation and sets off asthma symptoms. By knowing which allergens cause a reaction in your body, you can take actions to avoid them and prevent your airways from becoming inflamed and swollen.

Following are the most common things that trigger asthma. And don't worry, most asthma patients react to only a few triggers, not all of the ones listed below.



## HOUSE DUST

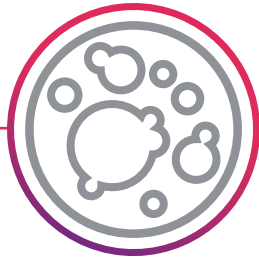
House dust contains both dust mites (tiny bugs too small to see) and a combination of dirt and allergens from mold, animal dander, insects, or pests. Breathing dust particles can irritate inflamed airways and set off allergic reactions. House dust is unavoidable, so it is important to keep your home clean.

Dust mites require two things to live: human dander (the skin flakes that people naturally shed) and moisture. Dust mites live in mattresses, pillows, carpets, bed covers, and upholstered furniture, and their allergens easily settle in furnishings and house dust.

How can you control dust mites and house dust? You need to do as many of these steps as possible to get symptom relief, as doing only one won't make a meaningful difference:

- Vacuum regularly with a HEPA (high-efficiency particulate air)-filtered vacuum.
- Protect mattresses and pillows with special dust-mite-proof covers to keep allergens out of your airways while sleeping.
- Wash bed linens, sheets, and covers every week in hot water (at least 130°F).
- If possible, get rid of carpets, extra pillows, and upholstered furniture, especially in your bedroom.
- Limit stuffed animals in children's rooms; use only those that can be washed weekly in hot water (at least 130°F).
- Dust often.
- Keep humidity levels in your home low, below 50%. Use a dehumidifier in damp areas, such as basements.





## MOLDS

Molds thrive on moisture. They live both indoors and outdoors.

Manage molds indoors by reducing moisture throughout your home in these ways:

- Keep humidity at less than 50% to discourage mold growth. If needed, use a dehumidifier, especially in basements.
- Repair water leaks wherever they occur, such as around pipes or in the walls or ceilings. Watch out for mold in areas where water is normally present.
- Check around and under sinks and in bathtubs and showers.
- If mold is visible on a surface, clean it with fungicide or a bleach-and-water solution. (Ensure good ventilation!)



## RODENTS

Rodents (mice and rats) have been linked to increased asthma symptoms. This can be a particularly difficult problem to avoid for some people living in cities.

To reduce exposure to rodents:

- Have your home professionally treated by a pest control service.
- Look for areas where rodents can enter your home, particularly in the spring and fall. Use steel wool to seal cracks in the foundation, holes around pipes, and gaps in walls.
- Store food in well-sealed containers.
- Make sure your trash (especially food waste) is stored in securely covered garbage cans or dumpsters outside and in securely covered trash cans inside.
- Mop and clean surfaces daily.
- Use traps to catch rodents. Avoid using chemicals that might trigger your asthma.

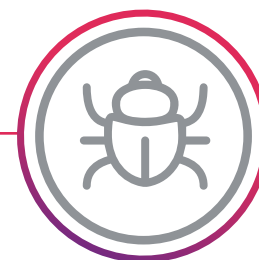


## OUTDOOR TRIGGERS

Tree, grass, and weed pollens and outdoor mold are common asthma triggers. Poor air quality from air pollution, smoke, car exhaust, and chemicals can also trigger asthma.

How can you prevent exposure to outdoor triggers?

- Keep the doors and windows to your house shut, with heating or air conditioning running—particularly when outdoor triggers are present.
- Avoid outdoor activities when pollen or ozone levels are high.
- If allergic to pollen, use allergy medicines to reduce reactions.
- Shower to wash away pollen when you come inside after spending time outdoors. Be sure to wash away pollens before going to bed.



## COCKROACHES

Cockroaches leave droppings behind that contain potent allergens. Cockroach allergies are a particular concern for people living in big cities.

If you live in a building with cockroaches:

- Keep your house clean and your food in tight containers.
- Make sure your garbage cans are sealed.
- Repair water leaks.
- Use traps and poison baits to control cockroaches. Sprays can irritate your airways.
- If spraying is necessary, use a professional service regularly and leave your home until any odor has cleared.

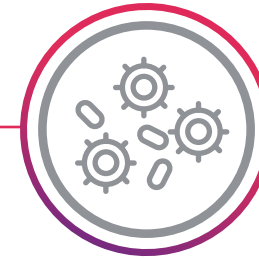


## ANIMALS

All warm-blooded animals produce dander (shedding skin, fur, and feathers), urine, saliva, and droppings. All of this material contains allergens that can trigger allergy and/or asthma symptoms.

If you or someone in your family has asthma:

- Don't keep furry pets in your home.
- If you do have a pet, keep it out of your bedroom and off upholstered furniture.
- Consider using HEPA filters in your heating and air conditioning system and replace them monthly. Be sure they are the correct size for your system.
- Keep pets off carpets as much as possible.
- Wash pets weekly and brush them outdoors, away from people with pet allergies.
- Dust and vacuum your house frequently—at least once a week.
- Note: Even after a pet leaves your home, it can still take months before the allergens completely disappear. You may continue to have symptoms for a while after the pet is gone.

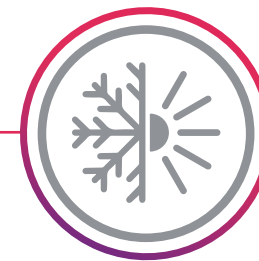


## INFECTIONS

Respiratory viruses and sinus infections can make asthma worse. In fact, viral infections, such as a cold or the flu, are the most common triggers in young children. They can be just as dangerous for adults.

What can you do?

- Get a flu shot every year. Ask your health-care provider about whether you should get a pneumonia vaccine.
- Be sure you and everyone in your household washes their hands frequently.
- See your health-care provider for immediate treatment if you suspect you have an infection. You may need to take more of your regular asthma medicines until the infection clears.
- Don't ignore a drippy nose. Talk to your health-care provider about medicines you can take to reduce the drainage.
- Don't share toothbrushes or toothpaste, especially when you have a cold.
- If your child gets viral infections every year, talk to your health-care provider about preventive asthma medicines to use before cold and flu season arrives.



## WEATHER

Weather conditions can affect the airways of people with asthma. Usually, this happens when the temperature is very hot, very humid, or very cold and dry.

What can you do to reduce weather triggers?

- Avoid outdoor activity when the weather is very hot, very cold, or very humid.
- Wear a scarf or mask around your mouth and nose to warm the air you breathe and protect your airways when you must be out in cold, dry weather.
- Keep humidity in your home at less than 50%, no matter the weather.





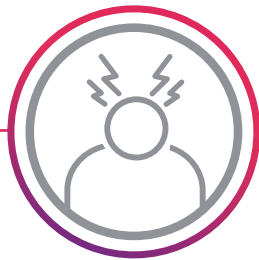


## SMOKING

Smoking cigarettes, pipes, cigars, and e-cigarettes (vaping) has a severe effect on asthma. Like other forms of smoking, vaping has been shown to increase airway inflammation, which can trigger an asthma attack. Children who live in homes with adults who smoke are far more likely to have asthma problems and ear infections.

If you or someone in your family has asthma:

- The best solution is not to smoke at all.
- Never allow anyone to smoke in your home, in your car, or around people with asthma.
- Ask smokers to wear a shirt or jacket while smoking outside that can be taken off upon returning inside.



## STRESS AND EMOTIONS

You may be surprised to learn that stress and strong emotions are common asthma triggers. Some people find that laughing or crying can set off symptoms. Research also indicates that stress, especially long-term or chronic stress, can increase inflammation.

How can you reduce stress?

- Think about the different events or situations in your life that cause you to feel stress. Take steps to reduce them wherever possible.
- Use regular stress management techniques, such as deep breathing, meditation, and yoga.
- Develop a regular exercise program and healthy eating habits.
- Healthy social interaction reduces stress, so spend time with friends and family.



## FOOD AND MEDICINE ALLERGIES

Many people with asthma have problems eating certain types of foods. This is especially true of foods that contain preservatives, called sulfites. Sulfites are found in beer, wine, shrimp, and processed potatoes.

- Some medicines can also cause problems, especially aspirin and beta-blockers, which are in some heart medicines and in glaucoma eyedrops.
- Talk with your health-care provider or pharmacist about all prescription and over-the-counter medications you take. Remember to ask about vitamins and herbal supplements to find out if any of them could affect your asthma.
- Stay away from any food or medicine that makes your asthma worse.
- Avoid eating foods that contain sulfites.
- Read food labels.
- Use substitute medicines when appropriate, such as acetaminophen instead of aspirin.





## REFLUX AND HEARTBURN

Heartburn is a common term for reflux, or GERD (gastroesophageal reflux disease), which causes a burning sensation in the chest. It is caused by stomach acids or foods coming up into the food pipe or swallowing tube, known as the esophagus. Eventually, the acids reach the throat and airways.

Reflux can trigger asthma and may make it difficult to control your asthma. Symptoms of reflux include indigestion, chronic cough, sore throat, nasal drainage, and chest pain.

What can you do to reduce reflux or heartburn?

- Some lifestyle changes can help. Avoid certain foods, alcohol, or tobacco.
- Lose weight.
- Sleep with your head slightly elevated.
- Don't eat or drink 3 hours before lying down to sleep.
- Talk with your health-care provider about medications that control stomach acid.

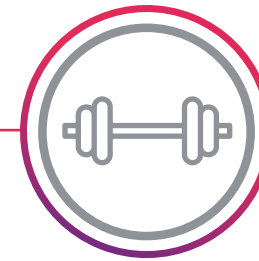


## STRONG SMELLS

Strong smells from paints, sprays, cleaning fluids, garden chemicals, scented candles, perfumes, lotions, hair sprays, and deodorants can trigger asthma problems.

To prevent a reaction:

- The best solution is to avoid these scents whenever possible.
- Stay away from your home when chemicals, paints, or sprays are in use and until the smell from them clears.
- Don't use scented products on your body or in your home.



## EXERCISE

While exercise is important for all people, it can trigger asthma symptoms for some. Still, regular exercise can improve your lung and overall health. Don't assume you should discontinue exercise if it triggers your asthma. Instead, work with your health-care provider to develop a safe and healthy exercise program.

What can you do to prevent exercise from causing an asthma attack?

- Do warm-up and cool-down exercises for 5 to 10 minutes before and after exercise.
- Ask your health-care provider about medicine you can take 15 to 30 minutes before exercising to prevent asthma symptoms.
- Wear a face covering when exercising in cold weather.
- Talk to your health-care provider about your symptoms if they persist when you exercise. They may be caused by non-asthma-related conditions (such as vocal cord dysfunction), or you may need additional medication.



## ILLNESSES THAT MAY AFFECT YOUR ASTHMA

Sometimes other illnesses may masquerade as or trigger asthma. Other lung diseases, such as COPD (chronic obstructive pulmonary disease), have symptoms that are similar to those for asthma. This similarity can make diagnosing asthma harder.

Other illnesses contribute to airway constriction, which can make asthma worse. They include allergic rhinitis (hay fever), sinusitis, obesity, and vocal cord dysfunction.

How can you manage illnesses that may affect your asthma?

- Ask your health-care provider whether you have any conditions that contribute to or may trigger asthma.
- Take steps to treat all your illnesses and make changes to reduce their effects on your asthma.

# ASTHMA IN CHILDREN

Asthma is diagnosed in children as young as infancy. Asthma is as serious in children as it is in adults, but it can be harder to diagnose. Children's symptoms are similar to those of respiratory infections, such as colds.



Common symptoms of asthma in children include:

- coughing spells
- wheezing or a whistling sound when the child exhales
- shortness of breath
- rapid breathing periodically
- chest tightness
- chest pain
- tiredness and/or less energy to play because of poor sleep
- coughing and wheezing that worsen with a cold or flu

Asthma in children is often linked to allergies, exposure to tobacco smoke or other air irritants, and obesity. It tends to run in families.

Most medications used to treat adults and older children with asthma can also be used for younger children. Parents need to work closely with their child's health-care providers to keep their child's asthma well controlled as their bodies change and grow.

The goal of treatment is to make sure children don't have flare-ups. They should sleep well, breathe easily, and avoid missing school and physical activities.



About 6 million, or 1 in 10, children in the United States between 0 and 17 years old have been diagnosed with asthma



Every year, 1 in 6 children with asthma visit the emergency department, and 1 in 20 children with asthma are hospitalized.



Most children with asthma experience their first asthma symptoms before age 5.



Asthma is responsible for 13.8 million lost school days for school-aged children who experience asthma flare-ups each year. Asthma is one of the leading causes of school absenteeism.

# CHILDREN AND ASTHMA: A TRUE STORY

*Brandon's asthma was triggered by an allergic reaction to grass and tree pollens*



One spring day when Brandon was 4 years old, he was playing in the park. He started coughing severely and having a lot of trouble breathing while playing tag. His mom, Alexis, took him immediately to the emergency department.

Alexis had asthma as a child and suspected he was having an asthma attack. She was right. It turned out that, like Alexis, Brandon's asthma was triggered by an allergic reaction to grass and tree pollens. Brandon's pediatric asthma specialist prescribed an inhaled corticosteroid. He occasionally has to use a quick-relief ("rescue") inhaler, too.

Now, 3 years later, Brandon wants to play recreational league soccer at the county park. Alexis is concerned that this will make his asthma worse. Another mother told Alexis that her daughter, Katie, has been receiving allergy shots to help her build up immunity to some of the allergens that trigger her asthma.

Alexis made an appointment with her asthma specialist right away. She wants to discuss allergy shots for Brandon and create an Asthma Action Plan so Brandon can play soccer safely.





# YOUR ASTHMA SEVERITY

Not long ago, it was believed that asthma was experienced the same way by all people. Today, science has shown that people react very differently to asthma triggers. By identifying your unique physical reactions in your cells, your treatment can be tailored to your specific biological changes.

This individualized study of each person's biological reaction to asthma is called heterogeneity of response. Different elements can affect your asthma reactions, type of inflammation, and treatment.

## Inflammation vs Bronchospasm

The first distinction in biological reactions is the difference between inflammation and bronchospasm.

### INFLAMMATION

Inflammation is a hallmark of asthma. Inflammation causes the lining of the airways to swell and thicken. This narrows the space available for air to flow through. The goal of medication (usually anti-inflammatory drugs) and treatment is to reduce or eliminate the underlying inflammation so the airways can open up.

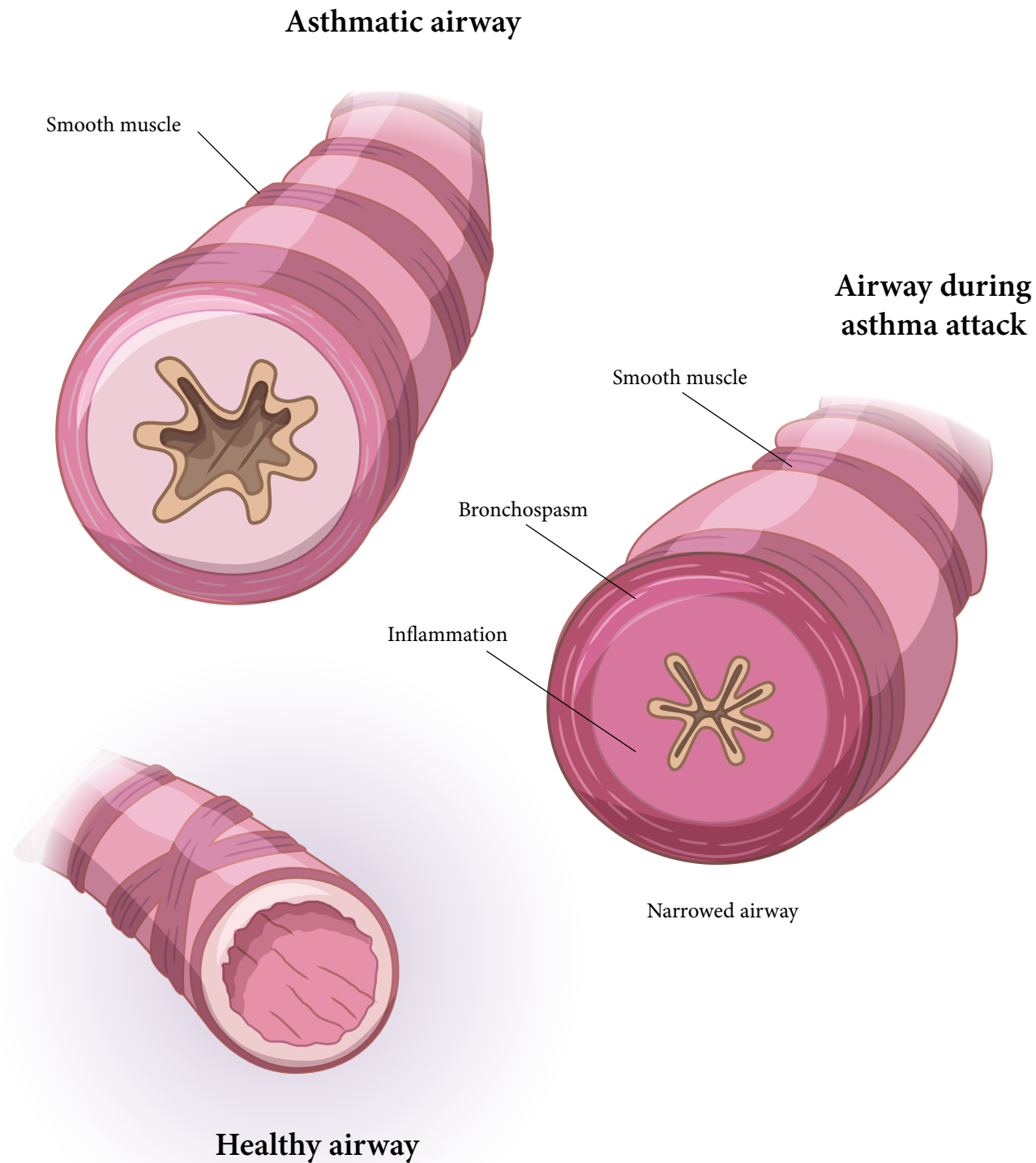
### BRONCHOSPASM

Bronchospasm refers to tightening of the muscles that surround the outside of the airways. This also narrows the space available for air to flow through. The goal of medication (usually bronchodilators) and treatment is either to prevent muscle tightening or to cause the muscles to relax so the airways can open up.

For most people with asthma, both inflammation and bronchospasm are present. Each requires different types of treatment to effectively control the asthma.



## Inflammation vs Bronchospasm




## Asthma Levels of Severity

Your health-care provider will discuss your current asthma condition in terms of its level of severity. There are 4 levels of asthma severity. The thing to remember is that most patients don't reach a certain level and stay there.



Asthma changes over time in response to triggers. That means your level of severity can go up or down at any time. This is why it is so important to keep monitoring and managing your asthma—even when it seems to be under control.

CHARACTERISTICS				
	Intermittent Asthma	Mild Persistent Asthma	Moderate Persistent Asthma	Severe Persistent Asthma
				
<b>Daytime symptoms</b>	Less than 3 times a week	3-6 times a week	Every day	Continuously throughout the day
<b>Nighttime symptoms</b>	Less than 2 times a month	3-4 times a month	5 or more times a month but not each night	Every night
<b>Use of rescue inhaler</b>	2 or fewer days a week	More than 2 days a week, but not daily	Daily	Several times a day
<b>Limitations</b>	No limitations to activities of daily living	Minor limitations to activities of daily living	Increased limitations to activities of daily living (more than 2 times per week)	Extreme limitations to activities of daily living

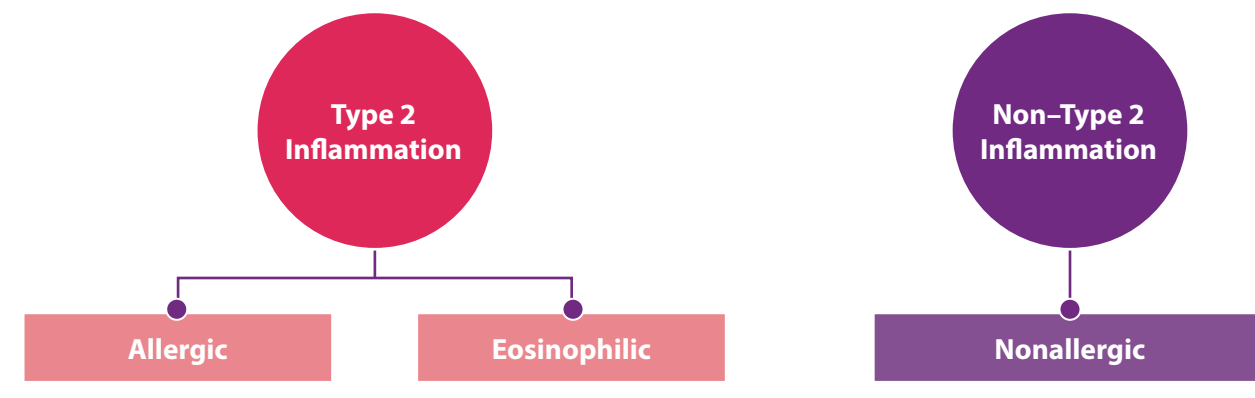
# TYPES OF ASTHMA AND PATHWAYS TO TREATMENT

## Types of Asthma

Different types of asthma may produce similar symptoms. However, triggers and clinical reactions alone are only the beginning when identifying specific types. Underlying reactions in your body provide clues as to the unique type of asthma you may have.

Today, asthma is examined on the basis of **phenotypes**. These observable traits or characteristics are a result of how your genes interact with your environment. A classification system groups asthma based on clinical, genetic, and environmental responses called **biomarkers**. The advantage of using this system is that it can help predict how your body will respond to specific treatments.

The major phenotypes associated with asthma are based on the type of inflammation that is the cause. Let's consider each category and what it means.



**Type 2 inflammation** includes forms of asthma that are driven by inflammation.

The most common causes are allergic asthma and eosinophilic (pronounced EE-oh-SIN-oh-FIL-ik) asthma. Allergic asthma can also lead to the production of eosinophils.

## ALLERGIC ASTHMA

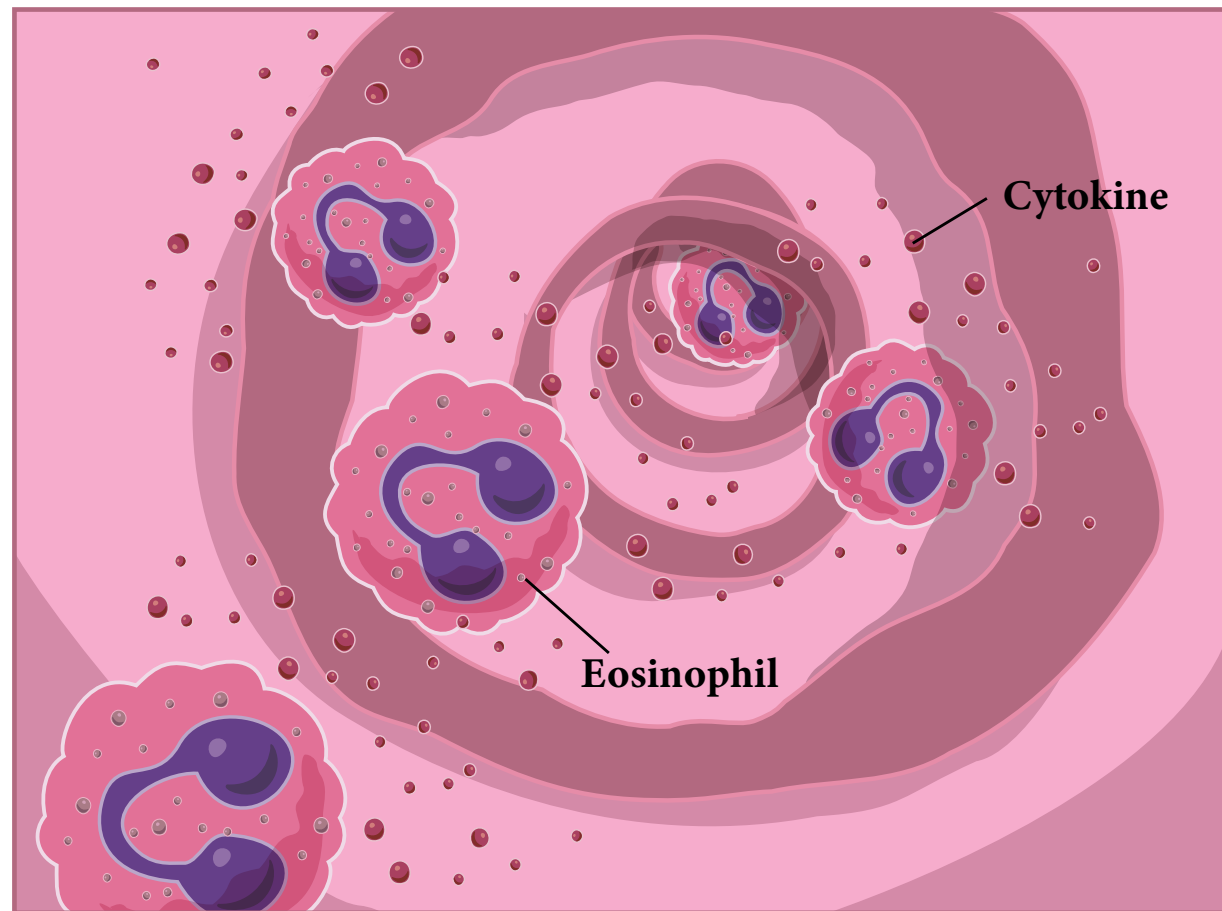
Allergic asthma is caused by allergic reactions to triggers such as dust mites, pets, pollens, molds, cockroaches, and rodents. It can also be associated with allergic diseases, like allergic rhinitis and atopic dermatitis. This type of asthma often starts in childhood.

## EOSINOPHILIC ASTHMA

Eosinophilic asthma (e-asthma) occurs when there is an abnormal increase in eosinophils in the bloodstream. Eosinophils are a type of white blood cell that naturally promotes inflammation to fight disease. Having more than a normal amount of eosinophils can lead to inflammation in the airways.



## Eosinophils



## NON-TYPE 2 INFLAMMATION

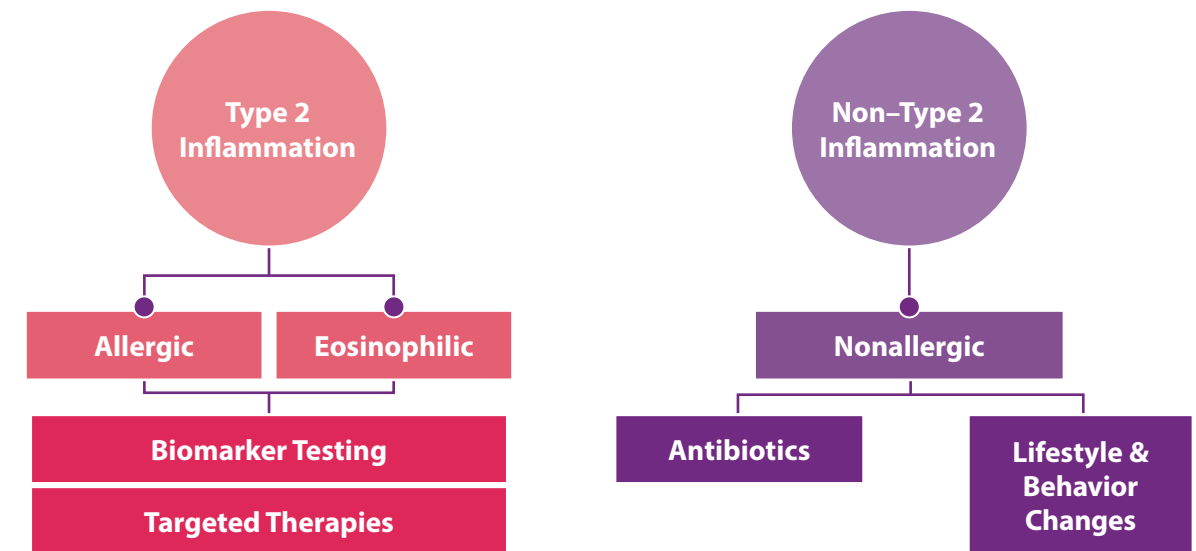
Non-type 2 inflammation is the category covering all types of asthma not caused by eosinophilic inflammation. Noneosinophilic asthma can be triggered by a wide array of causes, including poor air quality, food preservatives, tobacco smoking, stress, strong emotions, smoke in the air, or obesity. Nonallergic asthma often begins in adulthood.

It's worth noting that both type 2 inflammation and non-type 2 inflammation are often triggered by the common cold.

## PATHWAYS TO TREATMENT

Recent research has shown which treatment options work best for each asthma phenotype. That means that by identifying your type of asthma, your health-care provider can make a specific treatment plan tailored to you, which may help lead to better results.

Let's look at the treatment pathways for type 2 and non-type 2 inflammation.



Treatment for type 2 inflammation relies on **biomarker testing**. Biomarkers are observable biological, physiological, molecular signals that indicate what is happening in the cells of the body. Testing for specific biomarkers tells your health-care provider exactly how your body is reacting to inflammatory triggers. Based on this knowledge, your health-care provider can recommend **targeted therapies** that are tailored to treat your physical response or assessment of environmental conditions that could adversely trigger airway obstruction or inflammation.

Treatment for non-type 2 inflammation relies on **lifestyle and behavior changes**, such as staying indoors when the outdoor air quality is poor or losing weight, if recommended by your doctor. On special circumstances, some types of antibiotics (macrolides) can be used to treat this type of asthma.

## Molecular Targets of Severe Asthma

About 5% to 10% of people with asthma have severe asthma. Generally, that means that despite various treatments, their asthma is not controlled. They might have more daytime and nighttime symptoms, more flare-ups, more hospital visits, and more serious damage to the lungs.

New research has identified four molecular markers in the type 2 inflammation pathways that show how specific cells react and lead to greater inflammation. The molecular targets in your body vary depending on the type of asthma you have.

An increase in these biomarkers is associated with more asthma flare-ups and limited asthma control.

### IgE

(immunoglobulin E)

IgE is normally found in small amounts in the body, but sometimes it can increase dramatically when exposed to the allergens that trigger a reaction in your body. IgE can also stimulate other cells to behave in ways that increase inflammation.

### IL-5/IL-5R

(interleukin 5/interleukin 5 receptor)

IL-5 activates eosinophils and directs them to circulate to the sites of inflammation.

### IL-4/IL-4Ra

(interleukin 4/interleukin 4 receptor alpha)

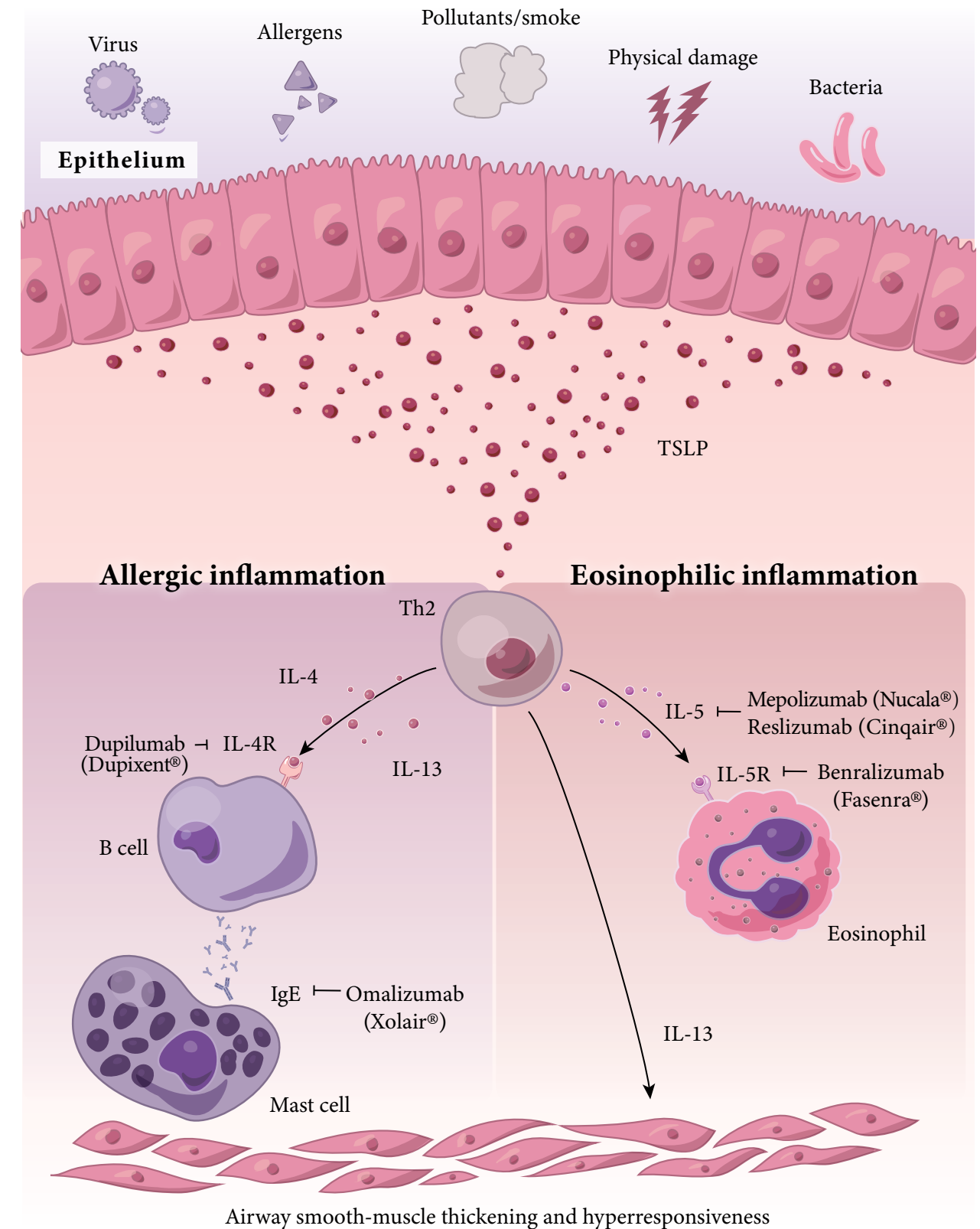
IL-4 does three things: (1) it signals other harmful cells to promote inflammation, (2) it sends eosinophils to the inflammatory areas, and (3) it causes the smooth muscles around the airway to contract.

### TSLP

(thymic stromal lymphopoietin)

TSLP activates different cells that stimulate an allergic response in the lungs, which increases eosinophil levels and leads to smooth muscle contraction.

## Type 2 Inflammation Pathways





## UNDERSTANDING YOUR ASTHMA MEDICATIONS

There are many medications used to treat asthma. Some focus on reducing inflammation, some work on relaxing the muscles that surround the airways, and some help reduce mucus production. The most important thing to remember about asthma medications is that they work only if you take them as prescribed.

Here are some of the most frequently prescribed medications for asthma treatment.

### Inhalers

Inhalers are the most common type of asthma medication.

There are two distinct types of inhalers used for asthma.

**RESCUE INHALERS:** Also known as quick-relief inhalers, these are used to provide quick, short-term relief during a flare-up (asthma attack). This form of treatment contains a medication that rapidly widens your airway (called a **bronchodilator**). It works by relaxing the outer muscles surrounding the airways to prevent the tightening that narrows the airways and limits air flow.

Examples of rescue inhalers include:

- Albuterol (ProAir® HFA, ProAir® RespiClick, Proventil® HFA, Ventolin® HFA)
- Levalbuterol (Xopenex HFA®)

**CONTROL INHALERS:** Also known as long-term control, maintenance, or preventer inhalers, this form of medication usually contains a steroid that works to reduce inflammation. Daily use of a control inhaler, even when you feel well, is important to prevent asthma from worsening. If your asthma is mild, you might be able to use this type of inhaler as needed—meaning only when you have symptoms. It is critical that you discuss with your health-care provider how frequently you should be using your control inhaler.

Examples of control inhalers with inhaled corticosteroids (ICSs) include:

- Budesonide (Pulmicort Flexhaler®)
- Beclomethasone dipropionate (Qvar RediHaler® HFA)
- Fluticasone furoate (Arnuity® Ellipta®)
- Fluticasone propionate (Flovent Diskus or HFA)
- Mometasone furoate (Asmanex® HFA or Twisthaler®)
- Ciclesonide (Alvesco®)





Another type of controller medication includes a long-acting beta agonist (LABA), which works to relax the muscles continuously over time. This type of medication should be used with corticosteroids in the inhaler.

**Examples of ICSs and LABAs include:**

- Advair Diskus® or HFA
- Breo® Ellipta®
- Dulera®
- Symbicort®
- Wixela®
- AirDuo RespiClick®

### SINGLE MAINTENANCE AND RELIEVER THERAPY (SMART) INHALERS

Some medications act as both a rescue inhaler (because they are fast acting) and a control inhaler (because they are long lasting). Examples include:

- Budesonide and formoterol fumarate dihydrate (Symbicort® HFA)
- Mometasone furoate and formoterol fumarate dihydrate (Dulera®)

## Other Medication Options

When your asthma is not controlled by using rescue and/or control inhalers, additional medications can be used.

### LONG-ACTING MUSCARINIC ANTAGONISTS (LAMAs)

These medications reduce mucus in and widen airways. This allows more air to flow through.

### ORAL CORTICOSTEROIDS

Oral corticosteroids are a kind of anti-inflammatory medication that reduces swelling and mucus inside the airway. This medication is used for asthma flare-ups and for severe asthma.

### LEUKOTRIENE MODIFIERS

Leukotrienes are chemicals that cause inflammation and excess mucus production in the lungs. The body releases leukotrienes when it comes into contact with an allergic trigger. Leukotriene modifiers are medications that reduce the number of leukotrienes the body releases. This prevents them from causing greater inflammation and increased mucus.





## Biologics

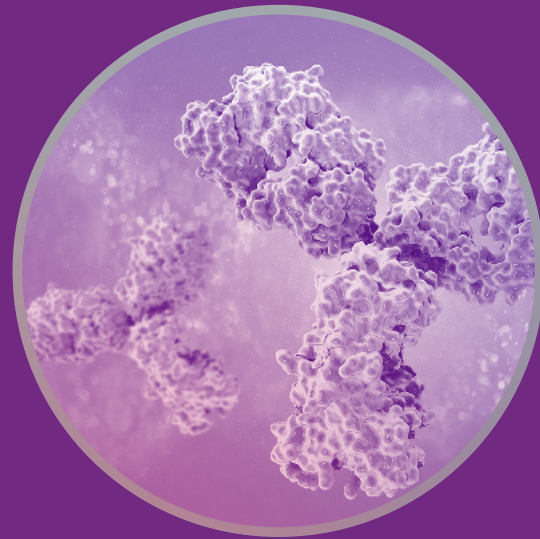
### Biologics take asthma treatment to a new level.

They target a specific cell or protein in the body to prevent inflammation in the airways. A biologic may be recommended if your asthma is not controlled with standard inhalers, if you have frequent asthma flare-ups, or if you frequently use or depend on oral steroids.

Currently, six biologics are available: benralizumab (Fasenra®), dupilumab (Dupixent®), mepolizumab (Nucala®), omalizumab (Xolair®), reslizumab (Cinqair®), and Tezepelumab (Tezspire®). Current biologics can target the following cytokines, mediators or receptors in patients with severe asthma: IgE, IL-4 receptor, IL-5, IL-5 receptor, and TSLP:

- Omalizumab targets an allergy antibody called IgE, which can reduce allergic inflammation.
- Mepolizumab (anti-IL-5), reslizumab (anti-IL-5), and benralizumab (anti IL-5 receptor) target pathways related to eosinophils, which are cells that contribute to inflammation in asthma.
- Dupilumab targets a receptor (IL-4 receptor) for two molecules that contribute to allergic inflammation (IL-4 and IL-13).

Biologics are delivered by an injection (shot) or intravenous infusion given every 2 to 8 weeks.



### Benralizumab (Fasenra®)

Benralizumab prevents the body from activating eosinophils, which reduces the amount of eosinophils in your blood and the number of asthma flare-ups. Benralizumab also reduces the need for systemic corticosteroids. Fasenra is given as a subcutaneous injection. It is delivered once every 4 weeks for the first 3 doses and then once every 8 weeks after that.

### Dupilumab (Dupixent®)

Dupilumab blocks IL-4/IL-4Ra from sending signals to produce some harmful molecules. It also limits eosinophils from being sent to areas of inflammation. Dupilumab reduces flare-ups, improves lung function, and reduces the need for systemic corticosteroids. Dupixent is given as a subcutaneous **injection** once every 2 weeks.

### Mepolizumab (Nucala®)

Mepolizumab neutralizes the IL-5 reaction. This prevents it from signaling and increasing eosinophilic activity. Mepolizumab prevents flare-ups, improves lung function, and reduces asthma symptoms. It also reduces the need for systemic corticosteroids, which can be harmful if taken for a long time. Nucala is given as a subcutaneous **injection** (a shot inserted under the skin) every 4 weeks.

### Omalizumab (Xolair®)

Omalizumab binds to the IgE molecules. This prevents them from combining with other cells that cause an inflammatory response. Omalizumab reduces flare-ups, particularly for patients with ever-present allergies (eg, dust mites, cockroaches, or pet dander). Xolair is given as one or two subcutaneous **injections** (shots inserted just under the skin). Depending on the patient's weight and IgE marker levels, it is given every 2 or 4 weeks.

### Reslizumab (Cinqair®)

Reslizumab acts similarly to mepolizumab. It neutralizes the IL-5 reaction to keep it from binding to eosinophils, reducing the number of eosinophils. Reslizumab also prevents flare-ups, improves lung function, and reduces asthma symptoms. Cinqair is given by intravenous **infusion**. It is given once every 4 weeks and takes about 20 to 50 minutes to administer.

### Tezepelumab (Tezspire®)

Tezepelumab (Tezspire®) blocks the action of a molecule called thymic stromal lymphopoietin (TSLP), which is made in the airways and contributes to the inflammation in asthma. It prevents asthma flare-ups, improves lung function, and reduces asthma symptoms. Tezepelumab is given as an injection under the skin once every 4 weeks.

## How to Take Your Asthma Medications

Most asthma medications come as sprays or powders that are delivered using an inhaler. When you inhale the medication, it goes into the airways of the lungs, right where it is needed.

The most familiar type of asthma inhaler is the metered-dose inhaler, or MDI. This pressurized device releases medication in a fine spray for you to inhale.

Small children and others may also use a nebulizer to deliver their medication. This machine turns liquid medicine into a mist that can be inhaled slowly over 10 to 15 minutes.

No matter which type of inhaler you use, it is important to ask your health-care provider or pharmacist to show you how to place your inhaler into or in front of your mouth and how to coordinate your inhalation with the spray. Before using your inhaler, you should also read the instructions that came with it and follow the priming and cleaning directions carefully.

### USING AN MDI

MDIs look the same on the outside, but each brand operates and needs to be maintained differently. Check the patient instruction sheet that came with your inhaler for details on using, cleaning, priming (getting ready to use), and maintaining the device.

### PRIMING

When the MDI is new or hasn't been used in a while, the ingredients may separate. Priming—releasing one or more sprays into the air before using it as treatment—helps ensure that the dose you inhale has the right amount of medication.

### COUNTING DOSES

Even the most perfectly timed inhalation won't help if there's no medicine left in the inhaler. That's why it's important to count each dose and each priming spray. By keeping count, you'll know when to replace the inhaler when you have used up all the medicine inside.

Many MDIs now have dose counters built in to make it easy for you to keep track of how much of your inhaler you've used. It is important that you don't rely on how the inhaler "feels." Many ingredients make up the medication spray. The MDI may continue to spray or feel full long after the active medication has been used up.





## How to Inhale Properly

Studies show that many patients do not use their inhaler properly. As a result, they do not get the full dose of medication. You must inhale the spray quickly enough to prevent it from landing on your tongue or inside your cheek, but slowly enough to let it get deep into your lungs.

Many people, especially children, have trouble inhaling from an MDI correctly.

A common solution is to use a valved holding chamber (VHC) or spacer.

These devices are easy to use and improve the delivery of the medication to the lower airways. They also decrease two common side effects of medication delivery: thrush (candidiasis) and hoarseness (dysphonia).

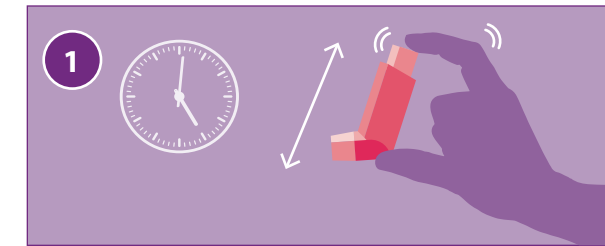
A VHC attaches to the MDI and has a one-way valve that allows you to spray the medication into the chamber and inhale it when you are ready or over several breaths. It can also be used with a mask attachment for young children and others.



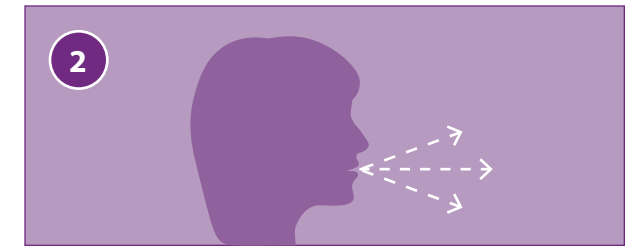
A spacer is an open tube placed on the mouthpiece of the MDI. It increases the distance between the MDI and the patient's mouth and directs the medicine into the chamber. Patients must still coordinate their breathing with the release of spray from the inhaler.



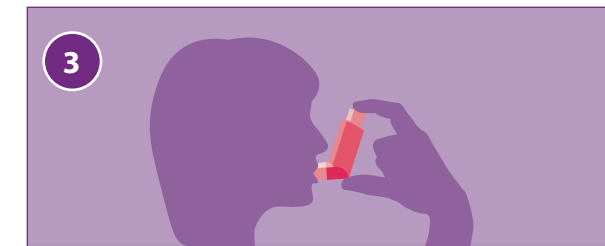
## INSTRUCTIONS FOR USING AN MDI WITHOUT A HOLDING CHAMBER



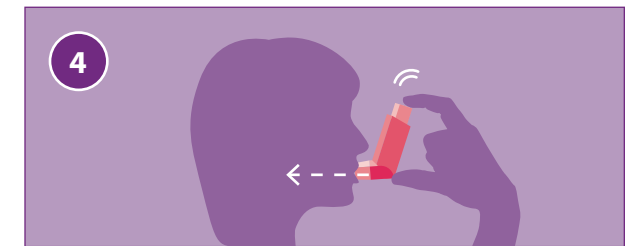
**STEP 1:** Take the cap off your MDI and shake the MDI well.



**STEP 2:** Sit up straight or stand up. Exhale fully, emptying your lungs as much as possible.



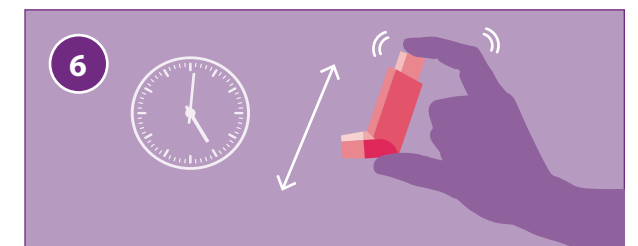
**STEP 3:** Hold the inhaler upright with the mouthpiece at the bottom and the top pointing up. Position it in or in front of your mouth. Be sure to keep your tongue out of the way of the spray.



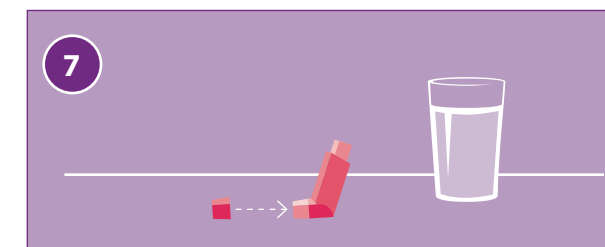
**STEP 4:** Begin to inhale slowly and then activate the inhaler a split second later. Keep inhaling slowly and steadily for 3 to 5 seconds or until your lungs are full.



**STEP 5:** Hold your breath for 10 seconds. If you cannot hold your breath for 10 seconds, hold your breath as long as you can.

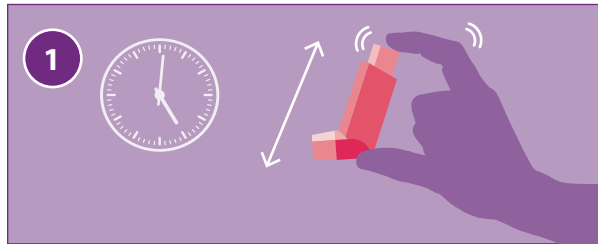


**STEP 6:** If you need to take another puff of medicine, wait 1 minute. After 1 minute, shake the MDI again and repeat steps 2 through 5.

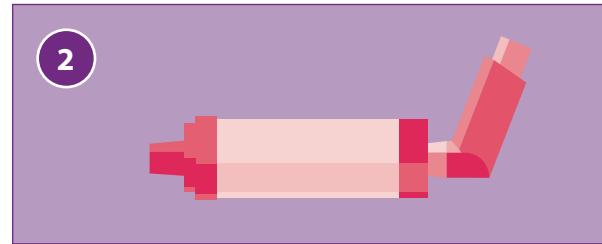


**STEP 7:** Recap the MDI. If your medicine is a corticosteroid, rinse your mouth out with water after you have taken your last puff of medicine. Make sure you spit the water out—DO NOT SWALLOW IT.

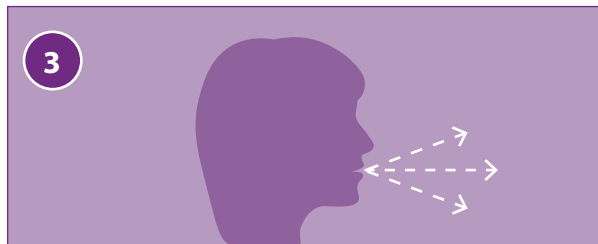
## INSTRUCTIONS FOR USING AN MDI WITH A HOLDING CHAMBER



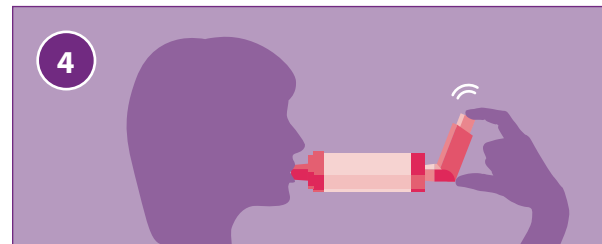
**STEP 1:** Take the cap off your MDI and shake the MDI well.



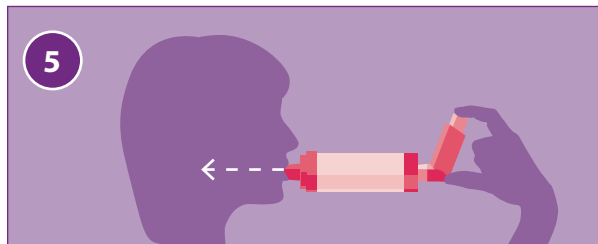
**STEP 2:** Attach the MDI to the holding chamber.



**STEP 3:** Sit up straight or stand. Exhale fully, emptying your lungs as much as possible.



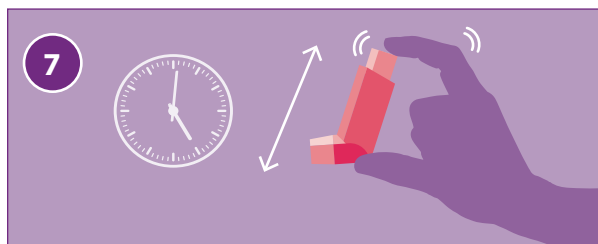
**STEP 4:** Put the mouthpiece of the holding chamber in your mouth. Close your lips around the mouthpiece and make a tight seal. Press down on the MDI. This puts one dose of medicine into the chamber. NEVER load more than one dose into the chamber.



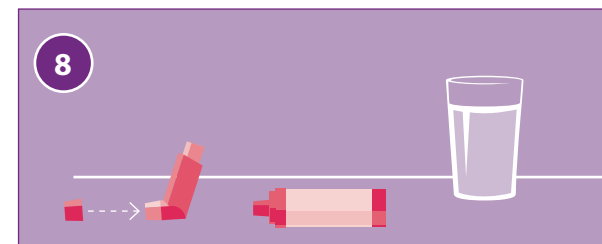
**STEP 5:** Take a slow, deep breath through your mouth. Breathe in as much air as you can. Try to fill up your lungs completely.



**STEP 6:** Remove the mouthpiece from your mouth and hold your breath for 10 seconds. If you cannot hold your breath for 10 seconds, hold your breath for as long as you can.



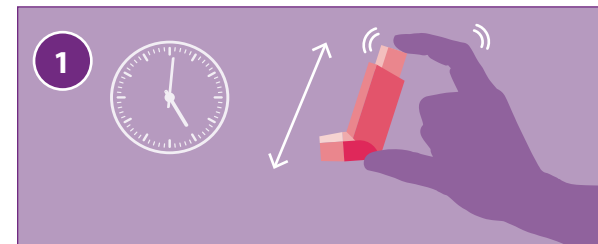
**STEP 7:** If you need to take another dose of medicine, wait 1 minute. After 1 minute, shake the inhaler again and repeat steps 3 through 6.



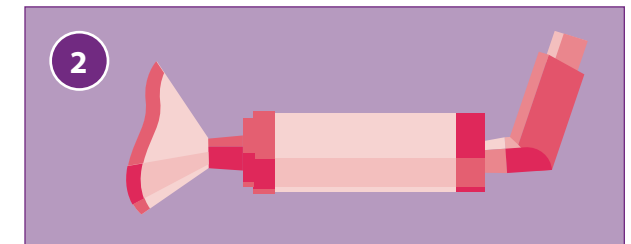
**STEP 8:** Remove the MDI from the chamber and recap both devices. If your medicine is a corticosteroid, rinse your mouth out with water after you have taken your last puff of medicine. Make sure you spit the water out—DO NOT SWALLOW IT.

## INSTRUCTIONS FOR USING AN MDI WITH A HOLDING CHAMBER AND MASK

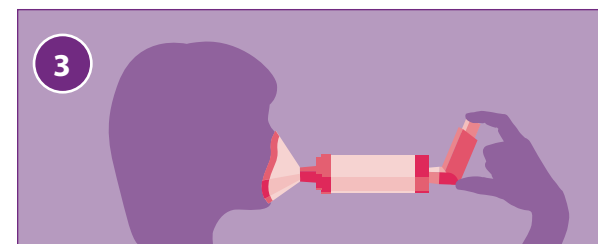
Holding chambers with masks are often recommended for children with asthma, but they are used by adults as well.



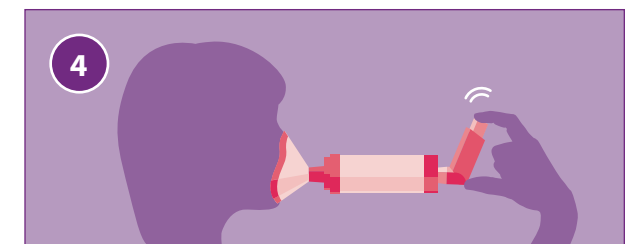
**STEP 1:** Take the cap off your MDI and shake the MDI well.



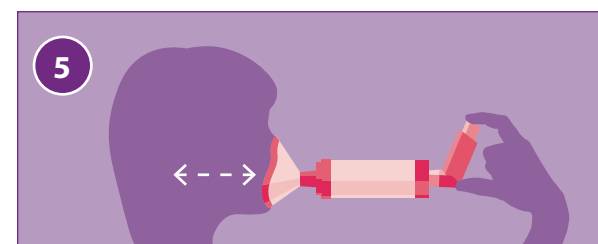
**STEP 2:** Attach the mask to the holding chamber (if it's not a single unit) and insert the MDI into the chamber.



**STEP 3:** The user should sit up straight or stand. Place the mask over the user's nose and mouth. The mask should fit firmly enough so none of the medicine can escape.



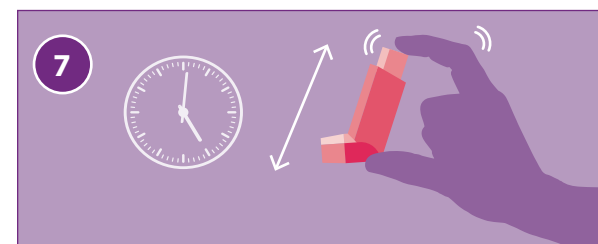
**STEP 4:** Press down on the MDI. This puts one dose of medicine into the chamber.



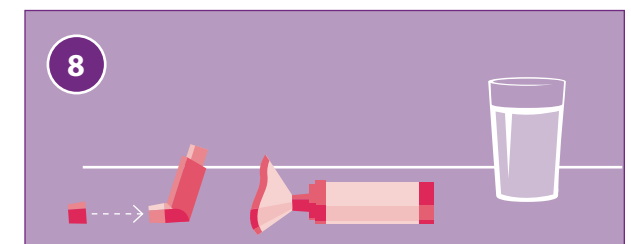
**STEP 5:** Have the user breathe in and out normally for six breaths to inhale the full dose of medicine. You can monitor the user's breathing by watching the valve open and close. Do not remove the mask until the sixth breath is completed.



**STEP 6:** Remove the mask from the user's face.



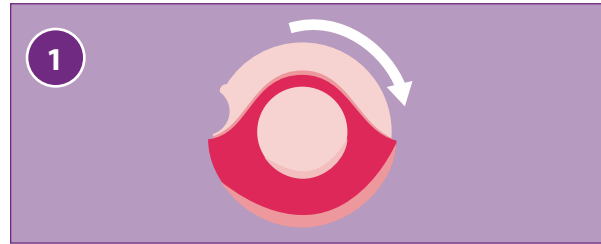
**STEP 7:** If you need to take another dose of medicine, wait 1 minute. After 1 minute, shake the inhaler again and repeat steps 3 through 6.



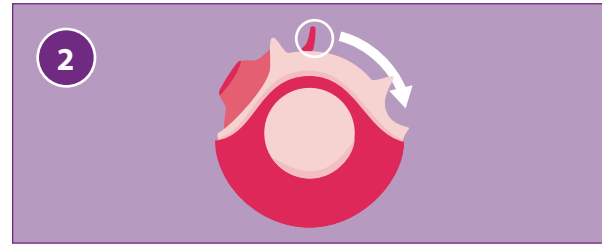
**STEP 8:** Remove the MDI from the chamber and recap both devices. If the medicine is a corticosteroid, the user should rinse their mouth out with water after the last puff of medicine. Make sure to spit the water out—DO NOT SWALLOW IT.

## INSTRUCTIONS FOR USING A DRY POWDER INHALER

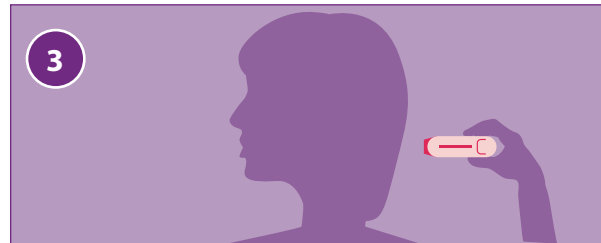
A dry powder inhaler (DPI) delivers asthma medication through an extremely fine powder that can be inhaled with a deep, strong breath.



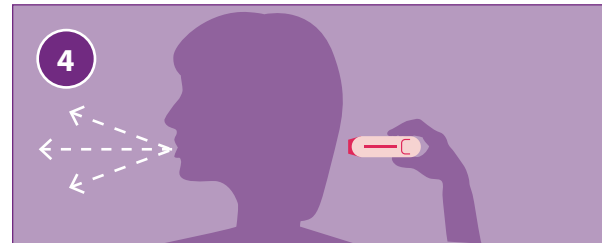
**STEP 1:** Open the inhaler mouthpiece or remove the cap from the inhaler.



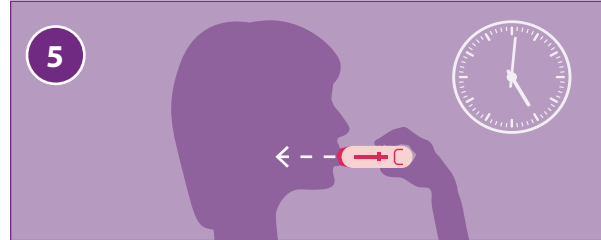
**STEP 2:** Load a dose of medicine into the inhaler by pulling back the lever.



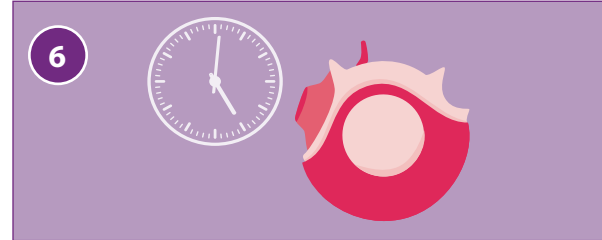
**STEP 3:** Stand or sit up straight. Hold the inhaler so the mouthpiece is horizontal to your mouth. **DO NOT** shake the inhaler.



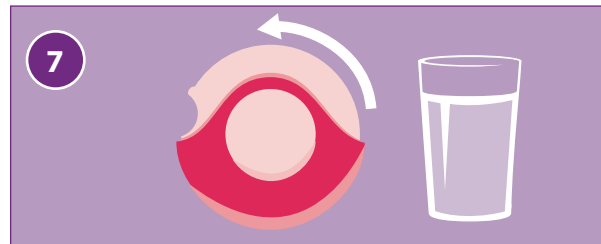
**STEP 4:** Turn your head away from the DPI. Take in a deep breath and blow it out. **DO NOT** blow (exhale) into the inhaler.



**STEP 5:** Place the mouthpiece of the inhaler between your lips and close your lips around it to form a tight seal. Take a **DEEP, QUICK BREATH** in through your mouth. Hold your breath and count to 10. If you cannot hold your breath for 10 seconds, hold your breath for as long as you can. Take the inhaler out of your mouth and breathe out slowly away from the inhaler.



**STEP 6:** If you need to take another puff of medicine, wait 1 minute. After 1 minute, repeat steps 2 through 5.



**STEP 7:** Close the DPI to cover the mouthpiece. The dose counter will display the number of doses remaining. Rinse your mouth out with water after you have taken your last puff of medicine. Make sure you spit the water out—**DO NOT SWALLOW IT.**

## MANAGING YOUR ASTHMA

Asthma tends to change a lot over time, with symptoms that come and go. This can lead to changes in your asthma severity. To manage symptoms, you'll need to work with your health-care provider over time. That means keeping regular appointments even when you feel fine. Well visits help you keep your asthma under control and identify problems early on. Having a team who knows you and your condition makes it easier to maintain effective treatment plans and deal with emergencies.

## PREGNANCY AND ASTHMA

**Controlling asthma is very important for women who are pregnant.** Healthy baby development relies on a lot of oxygen being delivered to the fetus from the mother's bloodstream. That means that women with asthma who are pregnant need to keep their airways open and their breathing clear so the fetus gets plenty of oxygen.

Asthma in pregnant women is unpredictable. For about a third, asthma symptoms worsen. In another third, asthma symptoms stay the same. In another third, asthma symptoms improve. There is no way to predict how your asthma will behave during pregnancy. Asthma is most

likely to worsen during the third trimester. Up to 45% of pregnant women with asthma have an asthma attack during their pregnancy.

Keeping asthma controlled during pregnancy requires careful monitoring. Make sure that your obstetrician is aware of your asthma and that your asthma specialist knows about your pregnancy as early as possible. Most asthma medications are safe to take during pregnancy.

Meet with your asthma specialist to review your medications and your Asthma Action Plan for your pregnancy. You'll also need to have your medications on hand during labor and delivery. About 10% of women with asthma have symptoms during labor and delivery, but an asthma attack is rare.

Women who experience changes in their asthma during pregnancy—either worsening or improving—generally go back to their prepregnancy asthma levels within 3 months after birth.





## Follow Your Asthma Action Plan

Another important part of your asthma management is an Asthma Action Plan. Your health-care provider will work with you to create an Asthma Action Plan that tells you what medicines to take and when to take them. It will also specify the things you should do to prevent symptoms and deal with flare-ups. You'll want to revisit this plan with your health-care provider at each visit.

Your Asthma Action Plan outlines treatment according to colored zones:

- Green Zone: You are doing well
- Yellow Zone: Your asthma is getting worse
- Red Zone: You need immediate medical attention

The Action Plan will give you guidance on which medicines you need to take, including dosages and frequency, both for everyday management and in cases of flare-ups.

Controlling your asthma may seem like a lot of work at first, but turning these steps into daily habits now can help you live a normal life. Remember to:

- Take action to control or avoid your individual asthma triggers.
- Keep a daily diary of your asthma symptoms to share with your health-care provider. This can help you evaluate and prevent problems with triggers, medications, or other issues that may make your asthma worse.
- Take your long-term control medicines daily or as prescribed.
- Always carry your quick-relief medicine with you.

## ASTHMA ACTION PLAN

Name \_\_\_\_\_ Date \_\_\_\_\_

Asthma Triggers \_\_\_\_\_

Asthma Severity:  Intermittent  Mild Persistent  Moderate Persistent  Severe Persistent

GREEN ZONE: When Doing Well		
SYMPTOMS: ✓Normal breathing ✓No cough or wheezing ✓Normal work or play ✓Sleeps well		
Medicine	Dosage	Frequency
Controller Medicine		
Quick-Relief Medicine		
<input type="checkbox"/> Take before all physical activity <input type="checkbox"/> Take as needed		
YELLOW ZONE: Caution – Take Action		
SYMPTOMS: ✓Coughing, wheezing, or chest tightening ✓Symptoms at work or play ✓Trouble sleeping		
Medicine	Dosage	Frequency
Controller Medicine		
Quick-Relief Medicine		
<input type="checkbox"/> Take before all physical activity <input type="checkbox"/> Take as needed		
If symptoms worsen even after taking your quick-relief medicine and you experience symptoms for more than 24 hours, follow the RED ZONE instructions and call your doctor.		
RED ZONE: Danger – Get Help Immediately		
SYMPTOMS: ✓Breathing is hard and fast ✓Can't talk well, work, or play ✓Medicine is not helping		
Medicine	Dosage	Frequency
Controller Medicine		
Quick-Relief Medicine		
<ol style="list-style-type: none"> <li>1 Take quick-relief medicine immediately</li> <li>2 Contact your doctor now</li> <li>3 Call 911 if: <ul style="list-style-type: none"> <li>✓You are still in the RED ZONE after 15 minutes</li> <li>✓You have trouble walking or talking</li> <li>✓Lips or fingernails turn blue</li> </ul> </li> </ol>		

Doctor's Name \_\_\_\_\_ Emergency Call # \_\_\_\_\_

## Coping with an Asthma Attack

Recognizing the symptoms of an asthma attack early may help you prevent it from happening.

### First, be sure you know the danger signs of a serious asthma attack:

- Severe shortness of breath (gasping for air)
- Inability to talk well (not being able to speak in a full sentence)
- Difficulty walking
- Lips or fingernails turning blue

If you experience these danger signs, you are having a major asthma attack.

Go to the emergency room or call 911 immediately!

You also need to know the signs and symptoms of less-severe asthma attacks, which include:

- Coughing, sneezing, itchy throat
- Tight chest, wheezing
- Shortness of breath
- Waking up at night
- Fast heartbeat

### When you feel an attack coming, follow these three steps:



**1**

Get away from the trigger that started your attack.



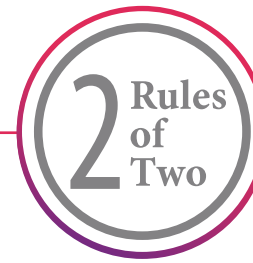
**2**

Take your quick-relief medicine as soon as you notice symptoms and then follow your Asthma Action Plan, which may advise you to take your controller medicine as well.



**3**

If you still have wheezing and shortness of breath, contact your health-care provider or get emergency help.



Many people with asthma are so used to poor breathing that they don't recognize the problem. It's best to go by the Rules of Two®—signs that your treatment plan is not working. Contact your health-care provider if:

- You have asthma symptoms more than TWO days a week.
- Your asthma wakes you up TWO or more times a month.
- You refill your quick-relief bronchodilator prescription more than TWO times a year.

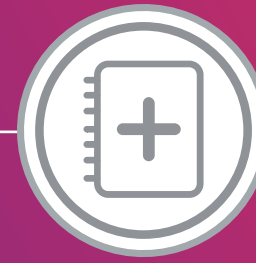
(NOTE: The Rules of Two® is trademarked by Baylor Health Systems.)



## When to See an Asthma Specialist

A visit to a specialist (an allergist or pulmonologist) may be in order if you continue to have symptoms that disrupt your sleep or everyday activities, even after following your management plan. The National Institutes of Health (NIH) asthma guidelines recommend seeing a specialist if any of the following apply:

- You have had a life-threatening asthma episode.
- You are not responding to treatment after 2 to 4 weeks.
- You have persistent asthma symptoms, limited physical activity, and frequent flare-ups.
- You need continuous high-dose ICSs or more than two courses of oral corticosteroids in 1 year.
- You need additional testing, such as allergy tests, complete spirometry breathing tests, rhinoscopy, or bronchoscopy.
- You are being considered for immunotherapy.
- You have conditions that complicate your asthma, such as severe hay fever, sinusitis, GERD, or exercise-related breathing problems.
- You require additional education on complications of therapy or allergen avoidance at home, school, or work.



## GLOSSARY

Being able to talk about your asthma is a big part of managing your asthma. Here are some terms you might hear from your health-care provider or see in this guide.



**Adult-onset asthma:** Asthma that develops during adulthood

**Allergen:** Anything that causes an allergic reaction, such as pollen, pet dander, and dust mites

**Allergic asthma:** Asthma triggered by allergic reactions or allergic diseases; often starts in childhood

**Allergy test:** Any of various tests that help your asthma specialist determine what allergens might be triggering your asthma

**Antibiotic:** A type of medication your doctor may prescribe to treat non-type 2 inflammation

**Anti-inflammatory:** In asthma, anything that reduces or prevents swelling or thickening of the airways; a type of medication that reduces inflammation

**Asthma:** A chronic lung disease that makes it hard to breathe. There are 4 levels: intermittent, mild persistent, moderate persistent, and severe persistent.

**Asthma trigger:** Anything that causes the airway to be inflamed or swollen, or to tighten

**Biologic:** A type of medication that targets a specific cell or protein in the body to prevent inflammation in the airways.

**Biomarker:** Molecular signal that helps your health-care provider know what is happening in the cells of the body

**Biomarker testing:** A test that tells your health-care provider exactly how your body is reacting to inflammatory triggers

**Bronchodilator:** A medication that relaxes airway muscles or prevents them from tightening. Long-term bronchodilators work to relax the muscles continuously over time; short-acting bronchodilators are used for quick relief when a flare-up occurs.

**Bronchospasm:** Tightening of the muscles around the outside of the airways; this causes narrowing of the airways

**Chronic obstructive pulmonary disease (COPD):** This term refers to a group of diseases that cause inflammation and airway obstruction in the lungs.

**Control inhaler:** Also known as long-term control, maintenance, or preventer inhalers, this form of medication, which is taken daily, usually contains a steroid that reduces inflammation.

**Dry powder inhaler (DPI):** A device that delivers asthma medication in a very fine powder that can be inhaled with a deep, strong breath

**Eosinophilic asthma (e-asthma):** Type of asthma in which an abnormal increase in eosinophils (a type of blood cell) causes inflammation in the airways; pronounced EE-oh-SIN-oh-FIL-ik

**Family history:** Your family's health history

**Fractional exhaled nitric oxide (FeNO) testing:** A test that helps your health-care provider determine how much inflammation you have in your airways by measuring the amount of nitric oxide (NO) you exhale. Higher NO levels may indicate swelling of the airways in your lungs

**Gastroesophageal reflux disease (GERD):** A digestive-tract disease caused by stomach acids or foods coming up into the esophagus. Eventually the acids reach the throat and airways, causing a burning sensation (heartburn) in the chest.

**Heterogeneity:** Variability or diverseness; in terms of asthma, this refers to each person's individual biological reactions to asthma

**High-efficiency particulate air (HEPA):** A HEPA filter can remove at least 99.97% of dust, pollen, and other airborne particles as small as 0.3 microns.

**Immunoglobulin E (IgE):** IgE is normally found in small amounts in the body, but levels sometimes can increase dramatically when exposed to the allergens that trigger a reaction in your body. IgE can also stimulate other cells to behave in ways that increase inflammation.

**Interleukin 4/interleukin 4 receptor alpha (IL-4/IL-4R®):** IL-4 signals other harmful cells to begin production, sends eosinophils to the inflammatory areas, and causes the smooth muscles around the airway to contract.

**Interleukin 5/interleukin 5 receptor (IL-5/IL-5R):** IL-5 activates eosinophils and directs them to circulate to the sites of inflammation. Likewise, the IL-5R is involved in the immune response.

**Interleukin-33 (IL-33):** A cytokine involved in the initiation of inflammation in asthma after an environmental exposure. With TSLP and IL-25, these cytokines are collectively called alarmins. Interleukin-25 (IL-25): a cytokine involved in the initiation of inflammation in asthma after an exposure. With TSLP and IL-33, these cytokines are collectively called alarmins. Another type of immune system molecule whose levels may be higher in people experiencing an allergic response

**Inflammation:** Swelling and thickening of the airways; a hallmark of asthma

**Long-acting muscarinic antagonist (LAMA):** A type of medication that reduces mucus in and widens airways

**Lifestyle and behavior changes:** Steps your doctor may recommend to reduce your exposure to asthma triggers, such as staying indoors when the outdoor air quality is poor, or losing weight

**Metered-dose inhaler (MDI):** A pressurized device that releases medication in a fine spray for you to inhale

**Methacholine challenge:** A test your health-care provider administers to help determine if you have asthma

**Nebulizer:** A machine that turns liquid medicine into a mist that can be inhaled slowly through a mask or mouthpiece

## GLOSSARY

**Nonallergic asthma:** A type of asthma that can be triggered by a variety of causes not related to an allergic reaction; often begins in adulthood

**Non-type 2 inflammation:** An asthma category that includes all types of asthma not caused by eosinophilic inflammation

**Phenotype:** Observable traits or characteristics that are the result of how your genes interact with your environment

**Physical examination:** Your asthma specialist will listen to your lungs and check your ears, nose, throat, and eyes for indications of allergy, such as inflammation. They also will examine your skin for eczema (atopic dermatitis).

**Priming:** Releasing one or more sprays from your inhaler into the air to help ensure the dose you inhale has the right amount of medication

**Rescue inhaler:** Also known as quick-relief inhalers, this type of treatment contains a bronchodilator that rapidly widens your airways, providing quick, short-term relief during a flare-up (asthma attack).

**Single maintenance and reliever therapy (SMART) inhaler:** A type of inhaled medicine that acts as both a rescue inhaler (because it is fast acting) and a control inhaler (because it is long lasting)

**Spacer:** A device that attaches to your inhaler; it improves the delivery of inhaled medication to the lower airways

**Spirometer:** A handheld device with a tube you blow into that helps your health-care provider determine your lung capacity

**Spirometry:** A lung function test of how much air you can move in and out of your lungs and how fast you can do it

**Sulfite:** A type of preservative found in some foods (eg, beer, wine, shrimp, processed potatoes) that can trigger an allergic asthma response

**Targeted therapy:** Treatment tailored to your individual physical response

**Thymic stromal lymphopoietin (TSLP):** TSLP activates different cells that stimulate an allergic response in the lungs, which increases eosinophil levels and leads to smooth muscle contraction.

**Type 2 inflammation:** An asthma category that includes all forms of asthma that are driven by inflammation

**Valved holding chamber (VHC):** A type of spacer that is one-way, allowing the patient to breathe air in only from the chamber, not out into the chamber

**Zone:** Your Asthma Action Plan outlines treatment according to colored zones: green zone means you are doing well, yellow zone means your asthma is getting worse, and red zone means you need immediate medical attention



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