

Part 1: What Is Asthma?

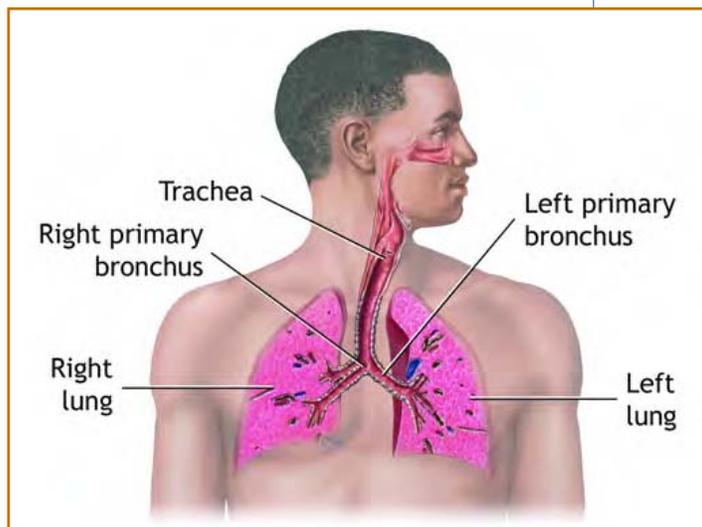
Healthy breathing

Healthy breathing is effortless. A person who is breathing normally will not be aware of the process. Every minute of every day, the lungs expand and contract 15 times. This process allows the blood to deliver oxygen to red blood cells and to take away carbon dioxide.

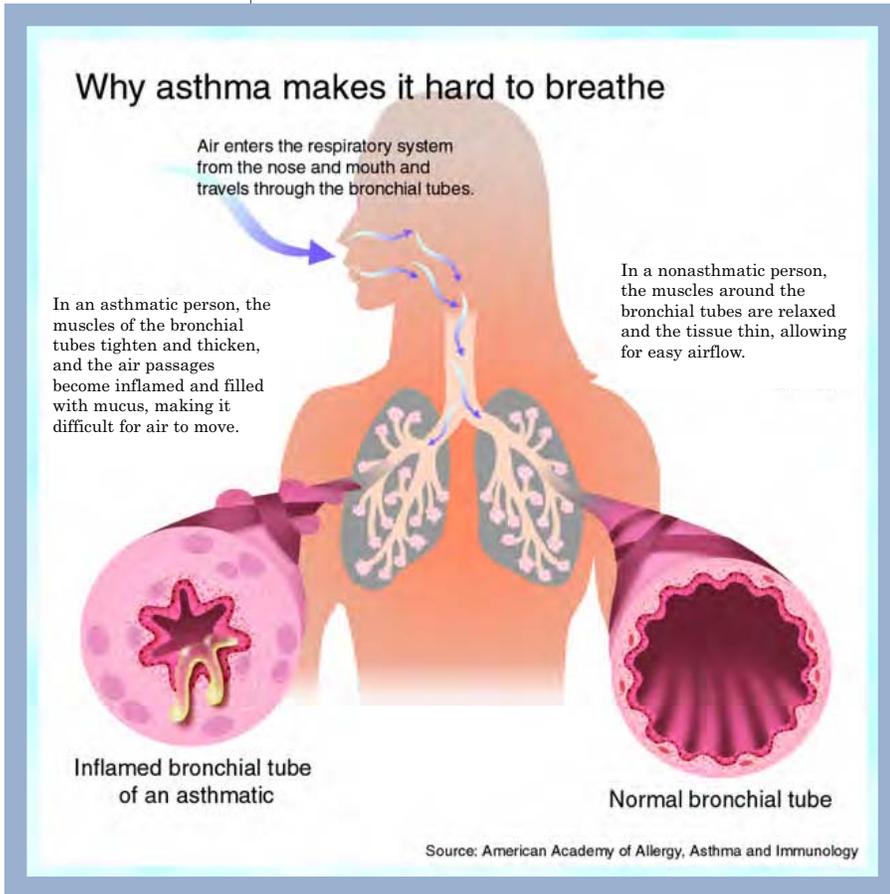
Air enters the nose, where it is warmed and moistened. Then, it enters the **trachea**, a single tube that is the beginning point of the airways. The trachea divides into two narrower tubes called **bronchi**. Each bronchus is a way into the lungs. As the air travels through the lungs, it moves through progressively smaller tubes called **bronchioles**. At the tip of the last bronchiole it enters, the air comes into contact with hundreds of millions of tiny air sacs called **alveoli**. These sacs take in oxygen from the air in exchange for carbon dioxide. Eventually, the lungs will exhale the carbon dioxide.



For the exchange of oxygen for carbon dioxide to take place, the **diaphragm**, a sheet of muscle that separates the chest from the abdominal cavity, must contract. When the diaphragm contracts, a partial-vacuum effect occurs around the lungs, causing them



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particles, the mucus is carried by **cilia** (which look like tiny hairs) from the bottom of the lungs to the throat. Once the mucus reaches the throat, it is either swallowed or coughed out. If the mucus is not cleared, viruses, bacteria, and other impurities can collect in the lungs and cause infection or illness. Healthy lungs are grayish pink in color. Lungs that are damaged by pollutants can become blackened.

If your breathing is not healthy or normal, it might be due to allergies or even asthma. Allergies have been linked to asthma, so it is not unusual to find that a person suffers from both. These disorders can be treated, and sometimes the symptoms can even be prevented. With proper medical care and changes in behavior or environment, someone who suffers from allergies or asthma can breathe comfortably and live an active life.

to expand. When the lungs expand, air pressure in the chest cavity is lower than the air pressure outside. This difference in pressure causes air from the outside to fill the lungs. Each time this happens, approximately 1 pint of air enters the lungs.

When you exhale, the diaphragm relaxes. When the lungs deflate, carbon dioxide is forced out. While this entire process is taking place, mucus in the air passages is trapping any foreign materials that have entered your body with the air. After the mucus traps these

Problems associated with asthma

Asthma is a chronic lung disease that makes breathing difficult. For an asthmatic, breathing becomes difficult for a variety of reasons. Airways can become inflamed, restricted, or blocked, so that very

little air can travel to and from the lungs. The air that does get through these narrowed passages can cause a high-pitched or whistling sound called wheezing. The chest can also become tight or constricted, requiring the person to use more effort just to breathe. This is called labored breathing.

If a lot of viscous (thick) mucus is released in the airways, it can produce coughing. As the body tries to clear the mucus from the airways, a rattling sound often occurs. If the airways become plugged with mucus, the lungs can fully or partially collapse. This collapse can be caused by a number of conditions, from prolonged bed rest to pneumonia, and can be seen on a chest X ray. Unfortunately, when a collapsing lung is found—especially in combination with a rattling sound heard in the chest—asthma can be misdiagnosed as bronchitis or even pneumonia. Antibiotics are often prescribed for bronchitis and pneumonia, but these medications are not effective against asthma.

The symptoms of asthma

People with asthma experience symptoms that can include coughing, wheezing, congestion, and tightness in the chest. Most of

these symptoms are usually associated with colds or infections. That is why it is important to notice when they reoccur for no apparent reason. When this happens, it could mean that you have asthma. Although asthma symptoms might resemble cold symptoms, they must be treated differently.

A viral infection, such as a cold, might make it hard to sleep at night for a few days. Nighttime asthma is very different. It can make getting proper rest nearly impossible for a long period of time. Some asthmatics have symptoms every night. People with nighttime asthma often have to sleep sitting upright in order to breathe. If these symptoms are disregarded as cold symptoms, then they will not be treated properly. A serious lack of rest can have dangerous consequences, especially for a developing child.

Symptoms of asthma are usually measured by their severity, frequency, and response to treatment. The National Institutes of



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Health has defined the following severity levels for asthma: mild intermittent, mild persistent, moderate persistent, and severe persistent. Those with the milder form of the disease might have brief episodes once a week.

Asthmatics with the most severe form of the condition have symptoms that won't go away, attacks that easily become crises, very little lung capacity, and restricted physical activity.

Whether symptoms appear to be mild or severe, it is crucial that they be evaluated. Even if you seem to experience symptoms only after exercise or during the night, an examination by a physician can be the first step in getting relief. For someone who has lived with the symptoms for a long time, the chest tightness and breathing difficulty can seem

almost normal. Having problems with breathing, however, is never normal or healthy.

Even some less common symptoms of asthma require emergency help. If an asthmatic suddenly starts to sweat, seems lethargic (or dazed), appears fatigued, or has difficulty speaking, he or she should be taken to an emergency room. If the person has severe difficulty breathing, intense coughing, a racing pulse, or **cyanosis** (nail beds or lips that are bluish in color), these are also signs of an emergency.

The causes of asthma

Scientists still do not know exactly what causes asthma. Researchers are investigating a number of possibilities, including

Severity Levels for Asthma

MILD INTERMITTENT—About half of all asthma patients fall into this category, which is characterized by fewer than two or three asthmatic episodes per week and no difficulty sleeping at night. No continuous control treatment is necessary.

MILD PERSISTENT—Patients typically have tightness and wheezing weekly, but relatively normal lung function overall. One controlling medication is sufficient to manage the illness.

MODERATE PERSISTENT—Daily episodes characterize this stage, but the flare-ups are manageable with two medications.

SEVERE PERSISTENT—Episodes occur daily, despite therapy with more than two controlling medications.

(Adapted from http://www.nih.gov/news/NIH-Record/03_04_2003/story06.htm)

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smog, lack of exercise, obesity, too much exposure to indoor allergens, and even a lack of exposure to viruses and bacteria in childhood, which could weaken the immune system. It is likely that a number of factors combine to cause asthma.

Scientists do know that many people with asthma also have allergies, such as hay fever or eczema, or a family history of allergies. Others, however, have no history of allergies or evidence of allergic problems. Asthma also seems to run in families. If one parent has asthma, his or her children are more likely to have asthma. If both parents have asthma, there is a 40% chance that their children will develop the disease. Although several people in the same family may have asthma, the severity of their symptoms may not be the same. Even if identical twins have asthma, one twin might have a more severe case of it. Scientists do not know why this is so.

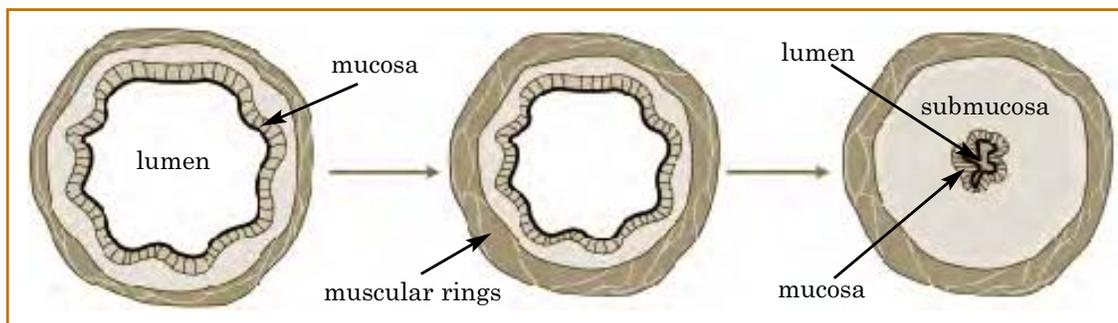


Although the exact causes of asthma may not be known, scientists do know a great deal about what happens inside the body when an asthma attack occurs. Specifically, three changes occur inside the airways in the lungs of people with asthma. The first change is inflammation (or swelling), which leads to constriction and sensitivity.

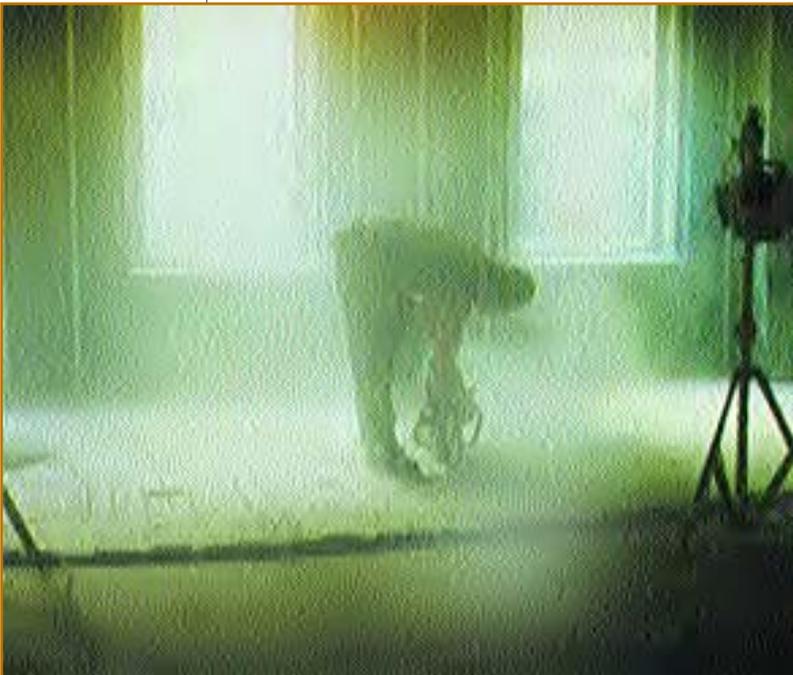
Airway inflammation happens when the **mucosa** (or bronchial mucous membrane) swells. The inflamed tissues make a thick mucus, which is difficult to get rid of and can often produce coughing. This inflammation then

Many children who have asthma come from families in which their relatives also have asthma.

This illustration shows the effects asthma has on a bronchiole. (left) Normal bronchiole; (middle) muscular rings contract and thicken, decreasing lumen size; (right) mucosal layers and their connective tissue, the submucosa, thicken, further closing the lumen, which fills with thickened mucus.



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What Causes Occupational Asthma?

Direct exposure to irritants. Substances such as hydrochloric acid, sulfur dioxide, and ammonia can trigger occupational asthma in those exposed to them. Commonly used in the petroleum and chemical industries, these irritants are particularly harmful to people with a history of respiratory disorders.

Allergic reactions from long-term exposure. A worker's immune system might take months or years before developing a reaction to a particular substance, but the symptoms can be quite severe. Everyday, common substances can trigger symptoms. A veterinarian can develop occupational asthma from exposure to animal proteins. A health care worker can suffer from asthma symptoms in reaction to the powder that lines latex gloves.

Accumulation in the body. Over time, workers who inhale certain substances can experience asthma symptoms because of a buildup of naturally occurring chemicals in their bodies. For example, an insecticide that is used in farming can cause acetylcholine to build up in a farm worker's body. This buildup can cause airway muscles to contract, resulting in an asthma attack.

leads to **bronchoconstriction** (or **bronchospasm**), in which the smooth muscle that surrounds the airways contracts too much, narrowing the airways and making it difficult to breathe. In people with asthma, inflammation also leads to sensitivity. This means that the airways are overly sensitive (or **hyperresponsive**) to even minor irritants. Such irritants can include tobacco smoke, air pollution, the common cold, or even cold air. If an asthmatic also has allergies, he or she can be overly sensitive to pollen, animal dander, or dust, for example.

Asthma can be triggered by both allergic and nonallergic reactions to various factors. Most asthma attacks are of the allergic variety, resulting from exposure to triggers such as animal dander and mold. These triggers exist in both indoor and outdoor environments. An asthma attack can result from high levels of pollen in the air or from cockroach droppings in household dust. A simple allergy skin test can help determine some of the triggers that cause the symptoms. (For additional information on triggers, see the section "Causes of Allergies" on page 22.)

Nonallergic asthma can be triggered by exposure to viral infections, shifts in air temperature, physical exertion, chemicals, med-

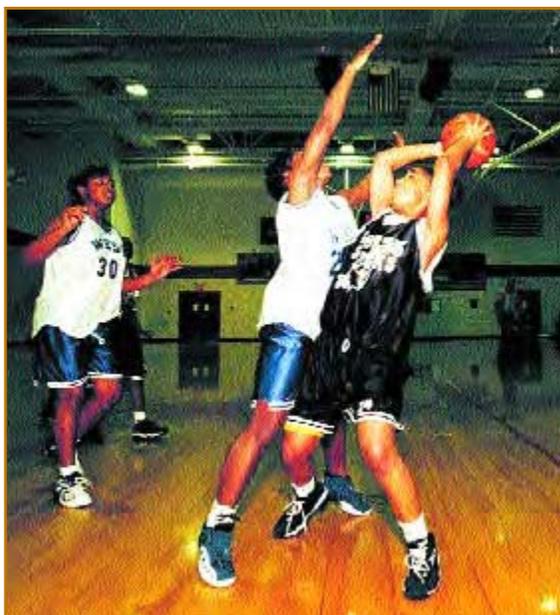
ications, or foods. Viral infections can bring on asthma especially in young children. When someone catches a cold, the nose, airways, throat, and lungs often feel irritated. This irritation can trigger asthma symptoms. A condition called **sinusitis**—in which the hollow cavities located behind the eyes and nose get inflamed—can cause asthma. Sinusitis can bring on wheezing, headaches, coughing, sinus pressure or pain, and postnasal drip. During an attack of sinusitis, excess mucus drains into the nose, throat, and bronchial tubes. This drainage can trigger or aggravate asthma.

Gastroesophageal reflux disease (GERD), a condition in which stomach acid flows up through the **esophagus**, affects many people who suffer from asthma. The symptoms of GERD include severe heartburn, belching, frequent coughing, hoarseness, and asthma at night, as well as after meals and exercise. Some asthma symptoms are relieved by medications prescribed for GERD.

Another type of nonallergic asthma is called **exercise-induced asthma**. It is triggered by strenuous physical activity. Intense, prolonged breathing through the

mouth can lead to coughing or tightness in the chest. Exercising in cold, dry air can also make breathing difficult.

Asthma symptoms that develop because of exposure to fumes, gases, dust, or other substances in the workplace are called **occupational asthma**. This type of asthma can develop in an asthmatic or in someone with no history of the condition. The symptoms of occupational asthma can continue even after the worker is no longer exposed to the substance that triggered the initial reaction. The symptoms can include a runny nose and eye irritation, as well as difficulty breathing. Occupational asthma symptoms often grow worse as the workweek progresses, get better over the weekend, and then



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Occupational asthma is the most common form of work-related lung disease in the United States.



resume when the person returns to work. Smoking can also worsen symptoms, as can being exposed to secondhand smoke.

A worker can be exposed to trigger substances for months or years before symptoms arise. Often, the symptoms of occupational asthma are misdiagnosed as bronchitis. This is dangerous because it can lead the worker to return to the environment that caused the symptoms. Continued exposure to triggers can be quite harmful. Employees are not the only people who can be affected by harmful substances in the workplace. Asthma can also occur in people who live near factories that release trigger substances into the environment. Leaving an asthma-inducing work environment within one to two years of the initial illness can reverse occupational asthma. For workers with the disease who smoke, research shows that those who leave the

unhealthy work environment and quit smoking are more likely to recover fully than is a worker who changes jobs, but continues to smoke.

In developed countries, occupational asthma has become the most common form of work-related lung disease. According to the American Academy of Allergy, Asthma, and Immunology, up to 15% of asthma cases that have been diagnosed in the United States have some connection to job-related factors. In certain industries, the rate of occupational asthma is quite high. In some manufacturing companies, exposure to particular chemicals needed for producing plastics and foam has resulted in symptoms in 10% of exposed workers. Inhaling a single enzyme that is used to make washing powder has triggered asthma in 25% of exposed workers. In the printing industry, regular exposure to gum acacia, which is used in color printing, has produced asthma symptoms in 50% of the workers exposed to it.

An asthmatic can also experience an attack as a result of taking particular medications. Some of the most common medications that trigger asthma symptoms are

aspirin and **nonsteroidal anti-inflammatory drugs (NSAIDs)**, such as ibuprofen. In fact, according to the American Academy of Allergy, Asthma, and Immunology, up to 19% of adult asthmatics have sensitivities to aspirin or NSAIDs. Medications called **beta-blockers**—which are taken to address heart disease, high blood pressure, glaucoma, or migraines—can prompt asthma attacks as well.

In about 6–8% of children, certain foods and food additives can bring on asthma symptoms. Some of the most common products that trigger asthma attacks are milk, eggs, peanuts, tree nuts (for example, walnuts or almonds), soy, wheat, fish, and shellfish.

It is important to note that anxiety alone cannot give some-

one asthma. However, emotional factors can make asthma symptoms worse or attacks more frequent. For example, if a person is under stress, he or she will probably feel more fatigued. This fatigue can increase the number of asthma symptoms or make them more intense. An anxious person might be more likely to hyperventilate, which can worsen asthma symptoms.

How asthma affects the body

In general, if asthma symptoms are addressed early and managed consistently, there is little risk of significant damage. Each asthmatic episode does take a toll on the body, so it is best to try to prevent symptoms whenever possible.



Breathing in smoky air from a fire can worsen asthma symptoms because smoke carries very small particles that can build up in your lungs. If you have asthma and live in an area where wildfires are common, you should talk to your doctor about a plan for smoky days.

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When an asthma attack occurs, a person experiences more than just difficulty breathing. The inflammation and obstruction of the airways, both of which commonly occur during an asthma attack, can be associated with permanent changes in the body. The airways can become permanently narrowed. Usually, airway obstruction does not cause any serious damage to the lungs, heart, or other organs. However, severe asthma attacks can lead to permanent damage or even death. During such an episode, an asthmatic can lose consciousness or suffer brain damage because too little oxygen reaches the brain. This is one of the reasons that it is vital to seek medical help as soon as possible when a severe asthma attack occurs.

When people suffer from exercise-induced asthma, their symptoms often appear after only brief periods of activity. Their airways tend to be overly sensitive to sudden changes in temperature and humidity. When people exert themselves, they often breathe cold, dry air in through the mouth. This does not allow the natural warming and humidifying action of the nose to take place. People with exercise-induced asthma tend to develop a reduced capacity to add moisture and warmth to the air before it reaches the lungs.

In addition, they have more difficulty exercising in environments where air pollution and pollen are common.

How asthma affects lifestyle

Asthma affects daily life in many ways. Often, an asthmatic must restrict activities to avoid exposure to trigger substances and factors. An asthmatic must be cautious when taking a new medication, tasting a new food, or entering a new environment. A person with chronic asthma must remember to take daily preventative medications on time. When going out, many asthmatics must arm themselves with “rescue” medications for use in case of an attack.

Frequently changes must be made to an asthmatic’s home or work environment to make breathing easier. Sometimes, bedroom carpeting and drapes, which can be home to dust mites, should be removed. If the parents of an asthmatic child smoke, they should quit. If a factory worker develops occupational asthma from a substance in his or her work area, the person should change job locations or professions.

For many people, a common cold is just a brief annoyance. For an asthmatic, this minor infection can produce asthma symptoms.

Asthma and Pregnancy

Studies have shown that pregnancy can worsen asthma symptoms, most often in the late second and early third trimesters. During the last four weeks of a pregnancy, women frequently report experiencing fewer symptoms. If asthma is managed properly throughout a pregnancy, a woman will rarely experience symptoms at the time of labor and delivery.

One reason that asthma symptoms might worsen during pregnancy is connected to GERD. When the stomach becomes compacted to make room for a baby, heartburn and acid reflux can result, making asthma symptoms worse. Sinus infections, viral respiratory infections, and increased stress can also worsen asthma symptoms during pregnancy.

Asthma in pregnant women is treated in the same way that asthma is treated in others. What is most important is that it be treated. If it is not, there can be dangers for both the mother and the child. When an asthmatic first discovers that she is pregnant, she should make an appointment with her allergist or primary care physician to discuss treatment. Like any other asthmatic, a pregnant asthmatic should avoid any substances or factors that are known to trigger symptoms.

Sometimes a patient and a physician must weigh the risks of unmanaged asthma against the risks of taking medication during pregnancy. Generally, it is considered far more important to control asthma symptoms. There are asthma medications that can be taken safely throughout pregnancy. Most inhaled medications are safe for pregnant women. Oral medications should be avoided unless absolutely necessary.

Generally, allergy shots are safe for a pregnant woman who was receiving them before conceiving. A woman should not start receiving allergy shots for the first time while pregnant. Sometimes, an allergist will lower the dosage in the shot to prevent an allergic reaction. These reactions are rare, but can be dangerous to a baby.

If a pregnant woman's asthma is not managed properly, serious complications can result. If not enough oxygen reaches the mother's blood, then not enough oxygen reaches the baby's blood. This deficiency can threaten the baby's growth and survival. A developing baby needs to receive a constant supply of oxygen. A baby born to a mother with unmanaged asthma can have a lower birth weight.

With some medicines, physicians are not sure whether asthma medications can be transferred to a baby through breast milk. Medications such as theophylline, beta agonists, cromolyn sodium, and steroids do not seem to be dangerous to nursing babies. To manage allergy symptoms, a nursing mother can safely use prescription antihistamines and decongestants.



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Influenza (the flu) can bring on more severe symptoms for a person who suffers from asthma. It is very important for asthmatics to avoid exposure to these viruses whenever possible. It is wise for asthmatics to get yearly flu vaccines. If an asthmatic is exposed to a cold or the flu, rest and proper nutrition can help to prevent the symptoms from escalating to asthma.

Often, asthmatics have difficulty when they exert themselves in ways that require deep breathing. Sports such as soccer, basketball,

and long-distance running, which demand continuous exertion, are more likely to trigger asthma symptoms. By contrast, sports like wrestling, gymnastics, baseball, and surfing require brief bursts of energy, which do not seem to aggravate asthma as often. Those who suffer from exercise-induced asthma are likely to find walking, slower-paced biking, hiking, and downhill skiing easier than the preceding sports. With treatment and careful training, an asthmatic can participate in almost any sport.



Benefits of Exercise

Exercise offers many physical and emotional benefits, especially for people who suffer from allergies or asthma. Exercise improves cardiovascular fitness, muscle strength, and stamina. Physical activity improves circulation throughout the body and one's general energy level. As a result of increasing physical activity, the body uses oxygen more efficiently and the respiratory system strengthens. Exercise elevates the mood and reduces stress. For people with allergies or asthma, the physical benefits of exercise improve their general health. In particular, it can help them breathe easier because more blood and oxygen reach the lungs. Exercise can ease the stress and anxiety that are often associated with asthma attacks. People with asthma should talk with their doctor before beginning a new exercise program, particularly a strenuous one.



Racing to Victory over Asthma and Allergies

As a competitive swimmer, Tom Dolan couldn't have designed a better body for himself. At 6 feet, 6 inches tall, with arms that seemed to stretch the width of a pool lane, he wasn't exactly a welcome sight to his opponents.

But what no one could see was that inside Dolan's imposing physique was an athletic flaw: lungs plagued by severe asthma and allergies. At times during his training workouts, Dolan would labor for breath and

even black out in the water. His college coach always kept an inhaler right next to the pool. But instead of quitting, Dolan kept training harder and swimming faster—until he made it to the U.S. Olympic team.

When he came home from the Olympics in Atlanta in 1996, it was with a gold medal—and he landed on the covers of *Sports Illustrated* magazine and a Wheaties box. He went back in 2000 to Sydney, Australia, and this time he did even better, capturing a gold and a silver.

"I had no superhuman qualities that helped me to overcome asthma, except the fact that I had a big heart and wouldn't allow myself to be beaten down by asthma," says Dolan. He also possesses an iron will: When he broke his arm at age 11, he wore a special foam cast and dragged his arm through the water as he swam countless laps.

Dolan's competitive spirit is legendary in his family. To get him to drink milk as a child, his father would simply pour two glasses and say, "Race you!"

But at times, asthma seemed like the one opponent that could really give Dolan trouble in the pool. Although doctors often prescribe swimming as an ideal exercise for asthmatics (because the humidity and warmth of the water can make breathing easier), it's with the understanding that asthmatics will swim slow, steady laps. The level of training Dolan underwent to take on the top swimmers in the world was so intense that some doctors worried that he could risk his health.

Dolan, continued on next page

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“When I was in high school, a lot of doctors told me not to swim,” says Dolan, who took up the sport at age five because his older sister was a swimmer and he wanted to beat her. “They were worried about all the chemicals in the pool affecting my allergies and asthma. I really had the worst of both worlds in terms of athletics. The harder and more intense my training was, the worse my asthma became. And in the fall, with tree mold, and the spring, with pollen, my symptoms got worse.”

When Dolan was in college, he found a doctor who specialized in asthma and who put him on a carefully monitored treatment regime. That helped Dolan’s symptoms immeasurably—as his row of gold and silver medals prove.

Dolan recently retired as a competitive swimmer and is now living in Arlington, Virginia, while he interviews with various corporations and prepares for a second career as a businessman. It’s a sure bet he’ll be successful in whatever he does—and, in a strange way, Dolan says he owes some of his confidence to asthma.

“One of the most frustrating things for young people with asthma is that there are only so many things that are in your control. You can’t control the heat and humidity and the air quality,” Dolan says. “For an athlete in an elite part of the game, we like to control everything. So asthma gave me a lot of perspective on the fact that swimming is just a sport and there are a lot of things out there that are more important. For all the troubles asthma gave me, it also gave me a lot on the other side to make me stronger.”

Part 4: How Can Asthma Be Treated and Prevented?

Diagnosing and treating asthma

When a physician completes an evaluation to determine whether a person has asthma, several tests are done. In addition to a physical exam, the physician will ask questions about the person's general health and symptoms.

If the person is experiencing symptoms at the time of the examination, the physician will try to rule out certain conditions. It is important to distinguish asthma from bronchitis and pneumonia, for example. Both bronchitis and pneumonia are caused by bacteria and can be treated with antibiotics. But antibiotics do not work for asthma. It is equally important that the physician zero in on the specific physiological causes of the symptoms. That is, which processes in the person's body are producing a cough or a wheeze? Different physiological causes often respond to different treatments. For example, bronchoconstriction will require a different form of treatment than airway inflammation.



Even if it appears that no symptoms are present at the time of the exam, **pulmonary function tests** can detect even minor blockage or airway obstructions. These tests can help the physician determine the cause of the obstruction, if there is one. The physician might also have the patient perform breathing tests before and after exercise to record any differences in breathing capacity. These tests can be conducted either in a physician's office or outdoors and are important for a person who seems to be suffering from exercise-induced asthma.

During office visits, a doctor or nurse may test a patient's ability to breathe to help figure out if he or she has asthma.

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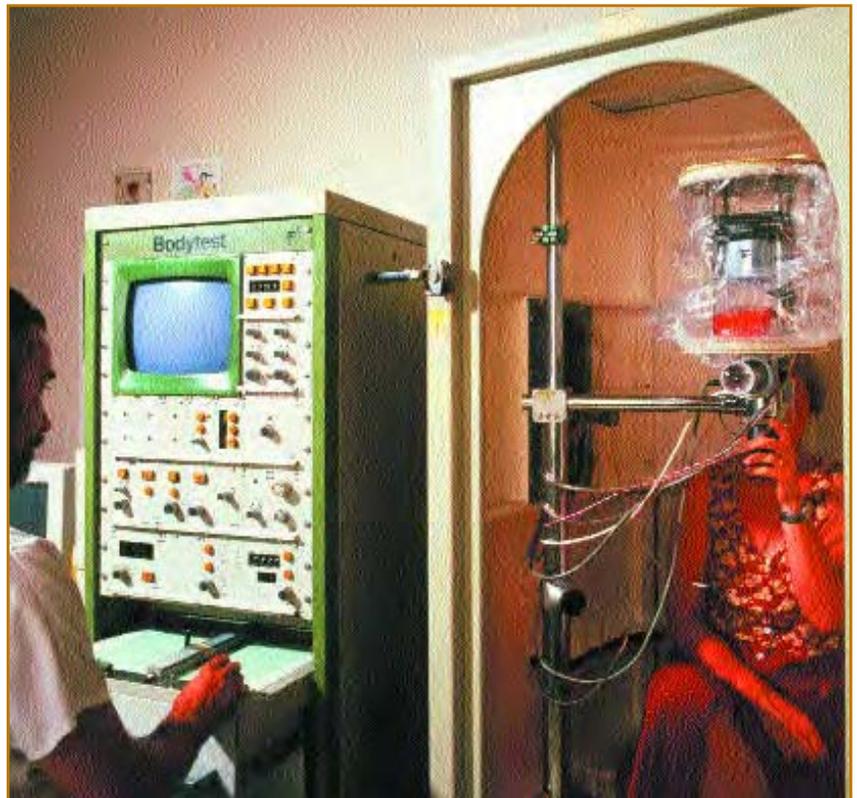
A **spirometer** measures the ability of a person to breathe out air from the lungs. If, after exertion, the person shows at least a 12–15% decrease in the volume of air blown out in one second—called the **forced expiratory value (FEV 1)**—exercise-induced asthma could be the cause. Outdoors, a portable spirometer can be used.

A device called a **peak flow meter** can also measure breathing capacity. If a peak flow meter is used, a 15–20% decrease in the volume of air blown out indicates that a patient is likely to have

exercise-induced asthma. Peak flow meters may also be used to determine when more or a different medication is needed.

Parents can help a physician evaluate whether their child suffers from asthma. Perhaps they have noticed that their child tends to withdraw from activities that require physical exertion. Maybe their child tends to cough or wheeze late at night or during a certain time of the year. There might be specific times when their child's breathing sounds heavy or noisy. These can all be indications of asthma.

A doctor may want to use a spirometer to test how much air an asthmatic can exhale. The computer that the spirometer is hooked up to draws a graph to show whether the patient exhales the same amount each time (normal lung function) or less each time (asthma or another lung condition).



Part 4: How Can Asthma Be Treated and Prevented?

Just as each person's triggers are different, the types and severity of symptoms vary.

This is why it is vital that each person understands the goals of treatment, the approach to relieving symptoms, and his or her responsibilities for maintaining good health. For younger patients, parental involvement in treatment is crucial. As children mature, they should be given more responsibility for their own asthma care.

Each person's asthma care plan is unique. The person being treated should actively participate in making decisions about his or her asthma care. The best way to do this is to learn as much as possible about the disease. Whatever the approach to treatment is, remember the following guidelines:

- If any part of the therapy is not effective, discontinue it under your doctor's guidance.
- Do what works, unless the risks of the treatment exceed the benefits of it.
- The side effects of the treatment should not be worse than the symptoms of asthma.
- The asthma care plan should be simple and easy to follow. (An example is shown in Appendix 1 on page 72.)



The inhaler dispenses a bronchodilator drug that widens the airways in the lungs.

Components for Managing Asthma

In its National Asthma Education and Prevention Program, the National Institutes of Health outlined four main components for managing asthma:

- Medical personnel should use objective tools such as the peak flow meter and the spirometer to assess how severe a patient's asthma is and then monitor treatment accordingly.
- Patients should avoid or eliminate environmental factors (for example, secondhand smoke, certain foods, strenuous physical activity) that trigger asthma attacks.
- Patients should consult a physician to obtain proper medications. The goals are to manage flare-ups in the short term and to prevent airway inflammation in the long term.
- The patient, the patient's family, and health care providers should form a partnership to define and implement the best treatment plan.

Preventing and controlling asthma

In trying to prevent or control asthma attacks, it is important to keep in mind certain overall goals:

1. Chronic symptoms such as wheezing and coughing must be minimized.
2. There should be access to daily treatments that allow for normal breathing most of the time. These are often called “controller medications,” such as steroid inhalers.
3. Every asthmatic should try to maintain normal activity levels, which include exercise.
4. Symptoms should be treated as soon as they appear, in order to minimize emergency room visits and hospitalizations. These treatments are in addition to controller medications and are often called “reliever medications,” such as albuterol inhalers.

It is never safe to withhold treatment. Asthma is not a condition that a person should hope to outgrow. Having trouble breathing is not something that will get better on its own. It is a symptom that needs to be treated. It is always safer to assume that narrowing airways will not open on their own. Mucus that blocks the pas-

sage of air to and from the lungs will not loosen on its own. If an asthmatic is under the care of a physician, any changes—improvements or setbacks—will be noted and treatments adjusted.

Even someone with an active form of the disease could experience brief periods without symptoms, especially as a result of treatment. This does not mean that it is safe to stop using the medications. The opposite is true. The medications have helped the person remain symptom free. The best way to increase the number of symptom-free days is to remain under the care of a physician and follow treatment instructions.

Intervention (or “rescue”) measures can be used to control and relieve asthma symptoms once they start. Controller medications, also known as maintenance medications, can be used to prevent asthma symptoms from occurring. Ideally, controller medications can lessen the need for rescue medications. If some attacks can be prevented, then there will be fewer symptoms to control. Once an asthma attack starts, its severity usually can be controlled. Whether a person has mild or severe asthma, there are ways to manage the condition. If asthma symptoms are not managed properly, a mild case can become severe and a severe

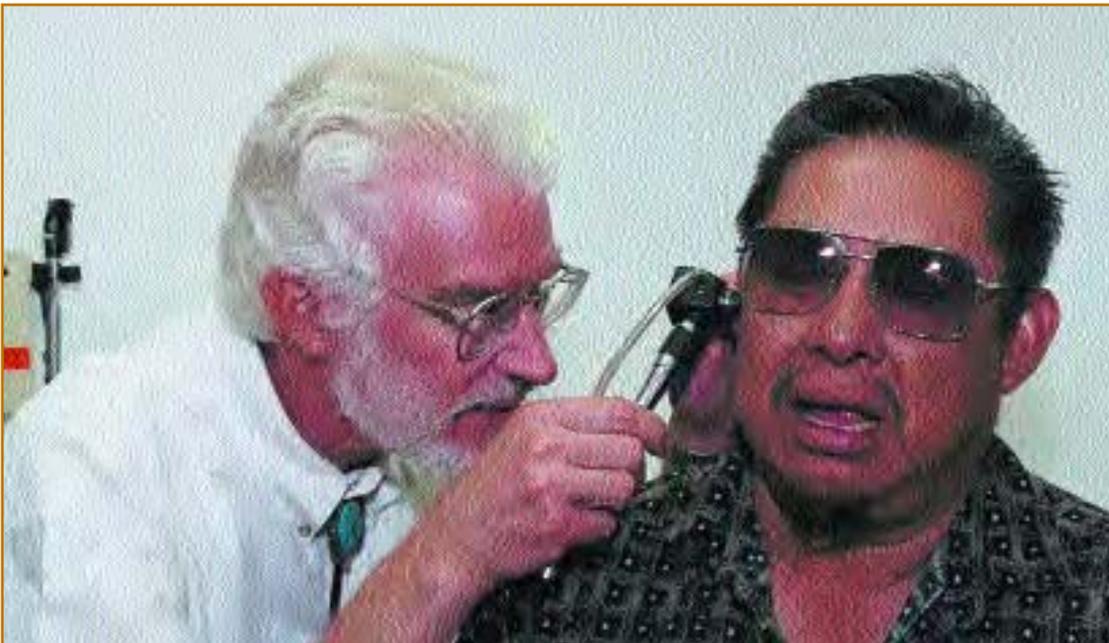
Part 4: How Can Asthma Be Treated and Prevented?

case can become fatal. Learn to recognize the warning signs that an attack might be getting worse. These warning signs can be different for each person.

Some asthma sufferers receive treatment only in an emergency room. Unfortunately, due to the high costs of health care, this may be a way for some people to afford treatment. But emergency care is not the best way to treat asthma. An asthmatic needs ongoing care from a physician, not just rescue measures. In addition, if only the flare-ups are treated, then controller medication cannot work to prevent future attacks. The symptoms will continue and will reach a crisis state before treatment is sought, which is bad for the person's overall health.

It is vital that an asthmatic use the correct medication for his or her condition. It is also important to use the medication as directed. Take the dosage that is prescribed—no more and no less. In some cases, medications need to be used daily, even on days when there are no symptoms. Steroid inhalers, for example, prevent symptoms only if used daily, as directed.

Many medications are effective in preventing and controlling asthma. Some of them are called anti-inflammatories. They do what their name suggests: They reduce the swelling of the airways, so that more air can travel to and from the lungs. Inhaled medications have the advantage of being administered directly to the area that is inflamed or



An asthmatic needs ongoing care from a doctor, not just emergency treatment at a hospital.

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obstructed. There are several devices used to administer inhaled medications. Many **metered dose inhalers (MDIs)** use a chemical propellant—usually a chlorofluorocarbon (CFC)—to force medication out of the inhaler. Pharmaceutical companies are in the process of developing other MDIs with propellants that, unlike CFCs, do not damage the ozone layer. Two types of inhaler that deliver medication without using CFCs are **rotary inhalers** and **dry-powder inhalers**.

A device called a **nebulizer** delivers a fine liquid mist through a mask that is placed over the nose and mouth or through a mouthpiece. These devices make inhaling medication easier, especially for infants, children, and those unable to use a standard inhaler. Some nebulizers are small and portable, have battery packs, and can be used for travel.

Using an inhaler can be difficult at first. An asthmatic should ask a health care provider to demonstrate how to use it properly. Often, it is a challenge to direct inhaled medication to the lower airways accurately; it tends to get sprayed onto the back of the throat. A **spacer**—a device that fits on the end of an inhaler and provides a holding chamber and one-way valves—can help adminis-

ter inhaled medication with greater accuracy. Never overuse an inhaler.

Inhaled medications often cause fewer side effects than oral medications do. The side effects associated with inhalers vary from headaches to hand tremors. Sometimes these side effects can impair learning in children. When a child has a headache, it can be difficult to concentrate. Hand tremors can influence a child's handwriting. It is important that both teachers and parents be aware of these side effects and make an effort to note any that occur. In many cases, the type or dosage of medication can be adjusted to prevent side effects.

People who suffer from exercise-induced asthma can benefit from using a reliever-type medication, such as a short-acting bronchodilator, 15 minutes before starting an activity. In one study, this form of inhaler was effective for up to 4–6 hours after inhalation in 80–90% of patients. Albuterol, pirbuterol, and terbutaline are among the medications in this category. In addition to preventing attacks, these inhalers can relieve symptoms after they start. A longer-acting inhaler can provide up to 12 hours of relief. If a child with exercise-induced asthma uses a longer-acting inhaler before leaving for



A young girl breathes into the face mask of a nebulizer to relieve her symptoms of asthma. The nebulizer delivers a fine spray of an asthma drug into the face mask and then into the throat and bronchial tubes. The drug is usually a bronchodilator, which reduces the constriction of the airways to the lungs that accompanies an asthmatic attack. Nebulizers are often used to treat emergency asthma attacks. Most patients find them easier to use than conventional inhalers.

school in the morning, it is possible that there will be no need for additional medication during the day.

Warming up before exercise and warming down after does more than just stretch muscles. For those with exercise-induced asthma, it is another way to help prevent the chest tightness that is caused by cold air suddenly becoming warm in the lungs.

Each person should play an active role in his or her asthma treatment plan. This is easy to do:

- Know your asthma care plan and when to use your controller and reliever medications.
- Learn both the brand names and generic names of the medications that are prescribed.
- Write down any side effects that result from taking these medications.

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Asthma Medications

Medications that are often prescribed to treat asthma include the following:

Anti-inflammatories (cromolyn and nedocromil are nonsteroidal examples)—These medications reduce swelling in the airways and lungs. Anti-inflammatories are not as strong as inhaled corticosteroids, but they cause fewer side effects.

Corticosteroids—Available since 1948, these steroidal, anti-inflammatory medications are prescribed in different forms. Creams can be applied to the skin to treat rashes. Inhalers are often recommended for asthmatics with daily moderate or severe symptoms. Pills are prescribed for those with severe asthma. Corticosteroids decrease swelling of the bronchial tubes, reduce the amount of mucus the body produces, and calm the airways. It is important to use these medications even on days when there are no symptoms, because they can help maintain healthy airways.

Bronchodilators (theophylline and anticholinergics)—Often called “rescue” medications, they open the bronchial tubes so that more air can travel to and from the lungs. These medications relieve coughing, wheezing, shortness of breath, and difficulty breathing. They are available as inhalers, tablets, capsules, liquids, or injections. They should not be overused. If a patient uses more than one canister (of an inhaler) a month, a new treatment plan should be considered. One exception is a long-acting medication—called salmeterol—which is designed for daily, preventative use.

Anti-leukotrienes—These are medications taken in pill form which fight the chemicals that cause airway inflammation and which make airways less sensitive.

- Report any changes in symptoms or triggers.
- Ask a health care provider any question that arises, and share any concerns.

Apart from medication, some adjustments can be made to both indoor and outdoor environments to help prevent asthma attacks. According to the American Lung Association, the best environment to live in is smokefree. This is especially important in homes with children. In fact, research shows that the children of smokers are twice as likely to have asthma as the children of nonsmokers. As a rule, it is best to avoid an envi-

ronment where secondhand smoke is common. Pregnant women should not smoke. Women who do smoke during pregnancy can give birth to babies who have narrowed airways.

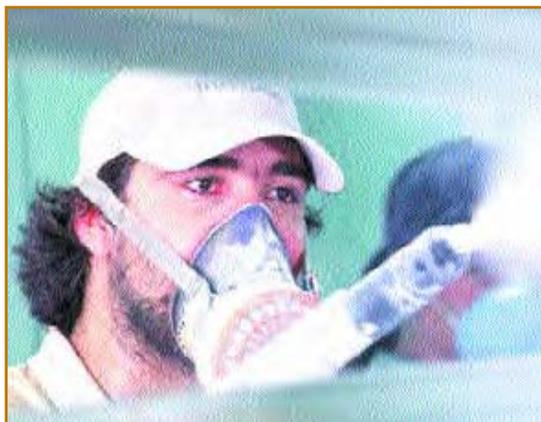
There are many forms of indoor and outdoor pollution. Whenever possible, it is best to avoid all of them. Indoors, many children and adults are sensitive to allergens that are known to cause asthma. These allergens include everything from cockroach and dust mite droppings to pet dander and mold. Cockroaches can be controlled or eliminated by using safe pesticides. Dust mites can be kept under control by doing several things regularly: Wash bedding in hot water (130°F or higher). Keep floors free of dust by vacuuming with a machine that has a special filter. Avoid placing carpets, rugs, drapes, and stuffed



animals in bedrooms. Irritants such as perfumes and strong cleaning agents or fragrances, which are found in many households, should also be avoided.

Outdoors, high levels of pollen and mold can trigger asthma symptoms in many people. Smoke from factories and exhaust from trucks can also be harmful. On days when the air quality is considered poor—often, days when ozone levels are high—doctors may tell patients to restrict physical activity or even to stay indoors.

Even for a person who suffers from occupational asthma, there are treatments that can provide some relief. Special masks (respirators) can also be used to filter out allergens in the workplace. Many workers—from bakers to hairdressers—are exposed to substances that trigger asthma symptoms. After the trigger substance is identified, it is important that the worker's exposure to it be eliminated. If medications or respirators don't solve the problem, the worker may have to move to a location where the trigger substance is not present. If a worker is removed from exposure within 1–2 years of developing symptoms, his or her asthma is more likely to be reversible. Employers should monitor the



levels of these substances and try to keep the levels low. Employers can check for early signs of occupational asthma by testing employees who are regularly exposed to harmful substances and ultimately can seek out non-harmful alternatives.

The relationship between allergies and asthma

Scientists have long known that there is a connection between allergies and asthma. Many people who have one condition will develop the other. In fact, asthma is sometimes called an allergic disease. Both allergies and asthma cause airway inflammation and narrowing of air passages. In an asthmatic, this reaction might be caused by a respiratory tract infection. In a person with allergies, exposure to an inhaled allergen might cause the same symptoms.

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Allergic rhinitis (hay fever) is considered a risk factor for developing asthma. According to the American Academy of Allergy, Asthma and Immunology, up to 78% of asthmatics also have allergic rhinitis. The symptoms of both conditions can be triggered by allergens that are either seasonal or year-round. Pollens, molds, animal dander, and dust mite and cockroach droppings are among the most common trigger allergens. Some people have **seasonal allergic asthma**, a condition that occurs over an extended period when high levels of allergens are common in a particular region of the country.

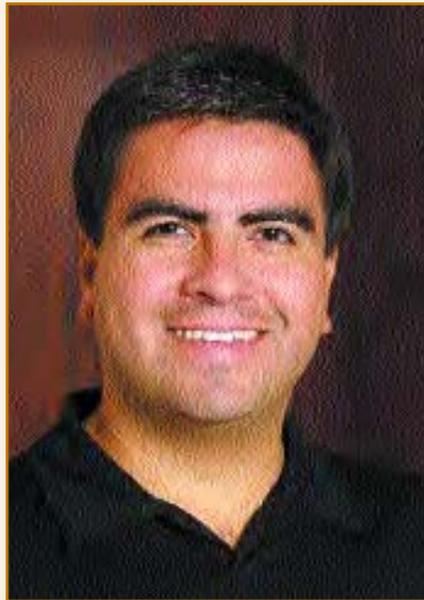


Many people who suffer from allergies will develop asthma. More than 50% of people who have eczema will become asthmatic. People who have symptoms of food-dependent exercise-induced anaphylaxis are often asthmatics as well. Those with asthma, eczema, or allergic rhinitis are at greater risk of having anaphylaxis at some point in their lives. This severe allergic reaction can occur as a result of exposure to foods, medications, latex, or insect stings.

The connection between allergies and asthma can help physicians in treating both conditions. For example, the majority of asthma attacks are triggered by allergic reactions. This means that if the allergic reactions can be controlled, the number of asthma attacks can be reduced. Many people with allergies are likely to develop asthma. This means that a physician should look for the early signs of asthma in such people and test their breathing capacity regularly.

The Case of the Unusually High Asthma Rates

Alexander Ortega has an inquisitive mind. Like a modern-day Sherlock Holmes, he likes to sift through facts and ponder difficult questions. A clue here, a trail picked up there, and suddenly, the pieces of a tough puzzle all fall neatly into place. But Ortega isn't a detective—he's an assistant professor of epidemiology and public health at one of the country's most prestigious universities, Yale University in New Haven, Connecticut.



Ortega's work, however, involves seeing patterns that aren't obvious to most people. Right now, he's trying to uncover the mystery behind the sky-high rates of asthma in Puerto Rican children.

Puerto Rican children have the highest asthma rates of children anywhere, with 30 percent of kids on the island suffering from the disease. Eleven percent of children who are of Puerto Rican descent, but live in the United States, are also afflicted.

What Ortega wants to know—and hopes to find out—is whether those kids are truly suffering from asthma or whether some of them have been misdiagnosed.

"There is a strong association between anxiety disorders in children and asthma—more specifically, to panic disorders and separation anxiety," he says. "The typical panic attack's symptoms are identical to the symptoms of an asthma attack: shortness of breath, chest tightness, and wheezing."

Could it be that thousands of children are really suffering panic attacks or anxiety, but are being treated for asthma? If that's the case, Ortega worries that the underlying mental health problems in a generation of chil-

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dren aren't being treated—and, like a domino effect, their mental health problems could worsen with time and affect their own children and families.

But that isn't the only issue Ortega is trying to sort out. If, indeed, many Puerto Rican children are suffering from anxieties and not asthma, then why aren't doctors identifying the real problem?

One reason could be that poor children don't have equal access to quality medical care and that white children in general tend to get better treatment. "We know that Hispanic and black kids, particularly those who live in the inner city and are poor and on Medicaid, are much more likely to be seen by residents or non-board-certified pediatricians," Ortega reports. One question he hopes to examine is whether doctors seem more willing to report that a child has asthma if that child is black or Hispanic.

Ortega—who himself has seasonal allergies and "wheezes in April and May"—says that many people, upon hearing of his work, assume that he is also Puerto Rican. "Actually, I'm Mexican-American," he notes. Growing up, he crisscrossed the United States as a "military brat," living in Honolulu and New Mexico before attending the University of New Mexico to study economics and then the University of Michigan to receive his Ph.D. in epidemiology.

Ortega hopes to be on the move again soon: He is hoping to receive funding for a grant that would allow him to focus on 1,000 kids on the island of Puerto Rico in an intensive, three-year study. That will give him a chance to collect more clues as he keeps digging into the complicated issue of those unusually high asthma rates.