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The Human Impact on the Environment and the Effects on Asthma and Allergies

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Introduction

Statistics have shown that asthma is an increasing problem to the point of being called an epidemic. Asthma has more than doubled over the latter part of the twentieth century. Hospitalization and even death due to asthma has risen dramatically, especially among children, and asthma has increased globally and is the leading chronic illness of children and the third chronic disease in the general population. One out of thirteen children has asthma and it accounts for the leading cause of school absenteeism. The disease can prevent even a mild sufferer of asthma from leading a fully productive life. From 1980 to 1994, the proportion of Americans suffering from asthma increased by 75%; in children, the proportion grew by 160%. Asthma also affects some minorities and low-income populations disproportionately [1] . One-fourth of Americans today suffer from one form of allergy or another. The prevalence of asthma is greater in women (5.6 percent) than men (5.1 percent) and in blacks (5.8 percent) than in whites (5.1 percent) [2] .

Food allergies are of real concern to the general public. With 8 percent of students allergic to certain types of food, particularly peanuts, efforts are being made to ban these products from school lunches. After the 2001 death of a peanut-allergic student in Massachusetts, action plans have been established to prevent and manage anaphylaxis in schools. This action plan is to be in place for the classroom, cafeteria, school sports, playgrounds, extracurricular activities, school trips, and school buses. All students must have access to an epinephrine autoinjector. Every school should have safety guidelines in place for students identified with food allergies.

Overview

This curriculum unit, entitled "The Human Impact on the Environment and the Effects on Asthma and Allergies," will be taught to four sixth grade general science classes at Betsy Ross Arts Magnet School in New Haven, CT. Currently, Betsy Ross is the only middle school left in the district. All other schools are kindergarten to eighth grade and then high school. Betsy Ross is an interdistrict magnet school with an

emphasis on the arts. It is based on meeting the needs of diverse cultures, learning styles and academic skills. New Haven is a college town, home to Yale University. Despite a rich history, New Haven is victim to poverty in certain neighborhoods and violent crime was at an all time high in 1990, making it one of the highest crime rates per capita in the United States. Efforts have been made to decrease the crime rate in New Haven and with 2009 being its safest year on record. Since our school is an arts magnet school, we draw students from the surrounding suburbs. We therefore, have a school population of diverse ethnicities, races, and socioeconomics. The demographics of New Haven Public Schools are as follows: Asian American: 1.24%, African American: 54.82%, Hispanic: 30.95%, Indian American: 0.05%, White: 11.08%, and Other: 1.86%.

The sixth grade curriculum has four science standards that must be taught throughout the year and these are **Ecosystems**, **Weather**, **How Technology Impacts Our Waters**, and **Simple Machines**. The following are the content standards for sixth grade science in New Haven: 6.2 - An ecosystem is composed of all the populations that are living in a certain space and the physical factors with which they interact. 6.3 - Variations in the amount of the sun's energy hitting the Earth's surface affect daily and seasonal weather patterns. 6.4 - Water moving across and through earth materials carries with it the products of human activities. 7.1 - Energy provides the ability to do work and can exist in many forms.

Rationale

The purpose of this unit is to educate students on what are the causes of asthma and how they can be responsible in reducing asthma symptoms by being aware of their environment and how this correlates to the symptoms. The unit, *Ecosystems*, looks at biodiversity and biodiversity opens the door to research on new medicines and cures for diseases. Students need to learn to protect the environment because the more we preserve the biodiversity of ecosystems, the more chances we have of discovering medicines from our environment that may cure diseases. The unit, *How Technology Impacts Our Waters*, addresses the fact of how science and technology affects the quality of our lives. Although the state of Connecticut is more interested on the impacts that science and technology have on water, in particular, the Long Island Sound, I will devote this unit into looking at how science and technology affects the air we breathe.

May is asthma awareness month. This is an opportunity to incorporate air pollution with the impact it has on our health, particularly those who suffer with asthma. Students will engage in inquiry-based learning using scientific investigations that will naturally foster curiosity and raise interest levels. Since so many students are asthmatic at my school, I feel it is vitally important for them to know as much about this illness and ways to avoid allergens. Since this will be personal for some, their natural curiosity will come into play.

Background

What Are the Facts about Asthma?

What do Theodore Roosevelt, Tom Dolan, Antonio Vivaldi, Nancy Hoghead, Ludvig van Beethoven, and Jackie Joyner-Kersee have in common? They are all famous asthmatics. Asthma has now reached epidemic

proportions in the United States and it affects millions of people regardless of race and age. Both the environment and genes are factors in the severity of asthma. With the increase of students with asthma and allergies over the years, it is apparent that we have become a society that relies heavily on medication to be a "cure-all" or "quick-fix" for whatever ails us without thinking of the after-effects such as where do these medications end up after they leave our bodies!?, and are these remedies doing more harm than good when we consider how we are to naturally respond to an invading entity that enters our bodies. Is it better to "treat" allergy and asthma symptoms through medication, or is it better to be well-educated on what causes allergic reactions and avoid these known allergens? Still, we need to realize and ask the question, how do we relieve the symptoms?

Asthma is a chronic respiratory disease that causes inflammation of the airways. This results in difficult breathing, wheezing, and coughing. An allergic reaction is a defense against an invading body. Does this mean that every allergic reaction is useful? Or does it mean that some people are more sensitive than others to different allergens? The reason why asthma and allergies will be used interchangeably in this unit is because most asthma sufferers are allergic to some offending agent which acts as a "trigger" to start the inflammatory asthmatic process.

Asthma is primarily a childhood disease. Over the last two decades, epidemiologists have called this increase of asthma sufferers, particularly in children, the "asthma paradox" because, although, there have been great improvements in medicines and therapy to treat asthma, there have been increases in morbidity and mortality as a result of asthma. In contrast to this being a paradoxical phenomenon, evolutionary theorists believe in the timing of biological events as the explanation for the rise in asthma. The natural history of our species is a fundamental beginning point for new analyses of human disorders and degenerative disease, as well as the effects of culture on human environments. This sets the stage for exploring the notion of mismatches or discordances between more evolutionarily stable or "expected" human physical, social, and psychological environments and the "actual" environments encountered by modern humans [3] .

What Are the Causes of Asthma?

What is causing this increase in allergies and asthma? Could it be because of poor nutrition, our polluted environment, predisposition to allergies, or a family history to asthma? One topic that has had many debates is "nature versus nurture." It is quite clear that with asthma, both entities play a role in this disease. Some scientists believe it may be due to modern people living in super clean environments, which causes our immune system to function improperly because it is not properly stimulated. Thus, a sterile environment may prevent infants from developing a strong immune system. Also, it has been hypothesized that certain medical and technological advances in the Western world play important roles in the increase of asthma. In particular, vaccines, purified drinking water, and antibiotics have prevented many typical early childhood infections and as a result may tilt the immune system towards an "allergic pathway." [4] Therefore, because our immune systems have fewer germs to fight, they may attack other things such as milk, peanuts, pollen, etc., normally harmless substances that cause an abnormal reaction.

Others believe the rise in asthma may be due to global warming. Warmer temperatures lead to a longer growing season for plants, therefore a longer time to produce pollen. This relates to the discussion of air pollution as being a cause. Smog in the air does cause some people to have difficulty breathing. Other airborne chemicals can compromise an asthmatic's health. Not only are there pollutants in the outdoor air, but indoors as well due to cigarette smoke; allergies to pet dander, dust mite feces, cockroach feces, rodent feces; use of aerosols; molds; and carpets that act as a natural trap of allergens. Allergens are factors that

"set off" an allergic reaction. Almost all asthmatics exacerbate their condition with exercise whether it's running, jogging, cycling, rowing, and swimming. The major cause of exercise-induced asthma is due to hyperventilation. There are also three medical conditions that can aggravate asthma. They are sinusitis, rhinicitus, and gastroesophageal reflux. Still other scientists believe that asthma and allergies have always existed but nowadays physicians are better able to diagnose these symptoms and report these findings.

What Role Do Our Genes Play in Relation to Asthma and Allergies?

Most experts do believe that genes play a role in childhood development of allergies. Children are more likely to have allergies if their parents have allergies. Looking into the history of asthma, we can discuss atopy of asthma. As mentioned earlier, when a person has an abnormal reaction to a normally harmless substance, the term "atopy" comes into play. Atopy means a condition in which people with genetic predispositions to allergy upon exposure to ubiquitous biological or chemical substances that are inhaled or ingested produce significantly greater quantities of the immunoglobulin E (IgE) than the average individual [5] . Atopy refers to a group of inherited diseases that are brought about by a type of altered reactivity. With new advances in immunology, asthma phenotype is better understood. Phenotype is an observable trait or characteristic of an organism due to its genotype and the environment. The genotype of an organism is the instructions carried in its genetic code. Therefore genes along with environmental factors are both key in how asthma fits in human populations.

What Happens Inside Our Bodies When We Are Exposed to an Allergen?

An allergen is a substance that produces an allergic reaction. These substances share two characteristics. One, they are always organic meaning they are alive or were once alive. Two, these substances are harmless to a nonallergic person. An allergic reaction has two phases, a sensitization phase and an effector phase and it requires three components: the allergen, the allergic antibody (IgE), and the mast cell. In the sensitization phase, a person comes in contact with the allergen, which then initiates the production of allergic antibody (IgE) by the immune system. The IgE travels through the bloodstream and attaches to the mast cells which line the respiratory tract. Upon reexposure to the allergen, the IgE that is attached to the mast cell will also bind to the allergen resulting in a process known as degranulation. At this point the cell releases a series of chemicals of histamines and other mediators resulting in an allergic reaction.

Why do we produce this antibody? Is it there to simply be a nuisance to cause these debilitating symptoms? The answer is that it is believed that this antibody, IgE, was first created to fight against parasitic worms because antibodies fight foreign invaders. Antibodies are proteins called immunoglobulins. Recent studies have shown that people that have been exposed to parasitic worms have reduced allergies and they have high levels of IgE in their system. Going back to our super-clean environments, without being exposed to these parasites will lead our bodies to fight against pollen and other allergens and be the casualties of this war. Interestingly, these same parasites that might have caused the evolution of the antibody may be used as a cure to fight asthma and allergies. Scientists are not one-hundred percent sure about why the evolution of IgE occurred; they do know that consideration should be given to the patients' care, but at what expense? What are long-range effects of treating the conditions with pharmaceuticals? Can they push for a change in one's environment? This may only be solved by those who can afford to change.

What is the History of Asthma?

We know that asthma existed since at least ancient Egypt, and there is evidence that asthma has been around long before that. The Georg Ebers Papyrus - found in Egypt in the 1870s - contains prescriptions

written in hieroglyphics for more than 700 remedies. One of the ancient Egyptian remedies against asthma was to heat a mixture of herbs on bricks and inhale their fumes. Asthma has evolved over time. It has been discovered that the immunological pathway to asthma is shared by other animals in the class Mammalia. In human history these pathways rid the body of parasites such as helminth worms (e.g., *Schistosoma mansoni*). To attack these parasites, production of the antibody IgE increases. Worms such as schistosomes, which cause liver and kidney failure, and filaria, which cause blindness, were all substantially greater problems before the introduction of modern sanitation and vector control. [6] This idea is still considered to be a hypothesis to explain the relationship between parasitic worms and increased levels of IgE.

What is the Relationship between the Environment and Asthma?

Environmental factors may account for the disproportionate number of low-income people and minorities developing asthma and allergies due to poor living conditions. As discussed earlier, research has revealed that there is an alarmingly high rate of asthma sufferers living in inner-cities. Housing for poor people is usually near factories that put out pollutants. There is substantial epidemiological evidence that asthma sufferers are more susceptible to air pollutants and these main pollutants are ozone, sulfur dioxide, nitrogen dioxide, and particulate matter. It is believed that these contaminants cause bronchial reflexes. Another problem is these contaminants cause airway inflammation. Since most poor communities are usually riddled with crime, most people tend to spend a lot more time indoors which leads to indoor air pollution problems.

On average, people spend over 90% of their time indoors and at least 50% of that time in the home [7] . Living in tight quarters, as in the projects, there is a greater risk of living with cockroaches. Studies have shown that not only are children affected by cockroach allergies, but adults are affected, as well. Not only is living in areas that may have increased levels of air pollution problematic, but poverty usually comes along with inadequate health care. While genetic predisposition contributes to asthma morbidity, it probably does not play a predominant role in the recent epidemic rise in asthma morbidity. Socioeconomic status and access to medical care, on the other hand, appear to be important correlates to asthma [8] . Many asthmatics in the inner cities are uninsured. Also, there could be language and cultural issues that may prevent people getting the medical attention needed.

What Can Be Done to Reduce the Incidences of Asthmatic Attacks?

In order to reduce the incidences of asthmatic attacks one must reduce exposure to known allergens. In the case of dust mites you should encase pillows and mattresses, launder bedding in hot water, remove carpets or treat carpets with an acaricide, vacuum using a HEPA filter and double-thick bags, and remove stuffed animals. To reduce animal allergens, you should remove the animal from the home. If this cannot be done then keep animal out of the bedroom, bathe a pet dog or cat once a week and vacuum carpets as outlined above. To reduce fungal allergens, you should clean washable surfaces with 5% bleach, remove contaminated carpets, keep windows closed in warm months and use air conditioning, avoid exposure to moldy vegetation, wear dust masks, and use air-conditioned vehicles. For cockroach allergens, you should remove wastes, fix leaky pipes, seal cracks in walls and floors, and bait traps with hydramethylanon or abermictin. Therefore, parents must adhere to stringent behaviors in the home in order to reduce the incidences of asthmatic outbreaks.

Another way asthma can be reduced is to acknowledge the socioeconomic status and psychological factors of asthma. Many studies have been conducted on the association between poverty, low educational levels and asthma. Families with the added burden of poverty may not prioritize good asthma management protocols.

Low educational levels will also lead to a lack of knowledge about asthma programs, thus limiting sufferers from getting the support they need. With these inadequacies, the increased stress on the asthma sufferer will heighten asthma prevalence and morbidity. Long-term solutions to the rising rates of asthma morbidity in these communities will therefore require significant social environmental changes as well as effective medical and behavioral interventions. [9]

What Are the Treatments for Asthma?

Besides avoiding particular known allergens as a means to control asthma, there are other treatments that can suppress the effects of asthma. There are two categories of medications used for the treatment of asthma. They are in the class of short-term control or *quick-relief* medications. The second class of medications is long-term control. All asthma patients must have short-acting relief such as albuterol metered dose inhaler (MDI) on an "as-needed" basis. Those patients that have persistent asthma should be using long-term medication, as well. There are drugs that have little anti-inflammatory activity, known as "bronchodilating" agents. These are "symptom treaters." These drugs relax the smooth muscle surrounding the bronchioles and this helps to enlarge the airway. There are three categories of agents: beta-adrenergic agents, theophylline, and anticholinergic agents. Then there are drugs that affect inflammation and have modest broncodilating activity. These drugs are potentially disease modifiers. These include corticosteroids, cromolyn sodium, and nedocromil. A new set of drugs, antileukotrienes, have modest-to moderate brochodilating activity and are anti-inflammatory as well.

Glucocorticoids (GCs) are the most effective treatment of asthma for the past 50 years. Oral glucocorticoids had short-term benefits, but long-term adverse side effects. These side-effects were reduced when GC was delivered directly into the airways by metered-dose inhalers (MDIs). The effects of glucocorticoids on the molecular level are that it binds to a specific cytoplasmic receptor called the glucocorticoid receptor (GCR) which is translocated to the nucleus and eventually binds to specific DNA sites called glucocorticoid response elements (GRE). There are between 10 and 100 genes that have GRE sites and are directly influenced by GCs. Many of the genes encoded for proinflammatory cytokines lack GREs Therefore, GC must also act to suppress inflammation, by interfering with nuclear transcription factors which are involved in the transcription of proinflammatory cytokine genes. GCs, on the cellular level, inhibit the effects on the inflammatory response associated with asthma, by inhibiting the transcription of multiple cytokines, thus, inhibiting inflammatory cell activation.

Theophylline is a second- or third-line defense in the treatment of asthma. It's considered a second defense because of its adverse affects. For severe asthma, theophylline can be used in conjunction with inhaled corticosteroid. It is an effective medication, but it must be used with limitation. There are many other short- and long-term medications that have been studied to treat asthma.

Another treatment for asthma is immunotherapy: the injection of allergens of which the patient is sensitive causing symptoms. The injections are given over a three-to-five year period gradually increasing the doses over time. It helps to produce a "blocking antibody." This therapy is most useful in controlling symptoms due to the inhalation of grass, tree, and weed pollen, certain mold spores and dust mite feces. This treatment has been recently developed and is termed as nonanaphylactogenic anti IgE monoclonal antibodies. What this does is to reduce IgE levels. The therapeutic anti IgE antibodies block the binding of IgE to IgE receptors. This particular binding affinity has two distinct advantages. First, the antibody will inhibit IgE effector functions by blocking IgE binding to high affinity receptors on IgE effector cells such as mast cells or basophils. Second, the antibody will not cause mast-cell or basophil activation because it cannot bind IgE on mast cells or basophils [10]

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What Are the Downsides to the Treatments?

The most common side-effect of inhaled GCs is local which could lead to thrush and vocal cord muscle myopathy. Myopathy is a disorder of the muscles affecting the muscle's range of motion. Other side-effects could lead to toxicity resulting in suppression of the hypothalamic-pituitary-adrenal axis, growth suppression, hypoglycemia, weight gain, psychosis, osteoporosis, cataracts/glaucoma, and opportunistic infection.

The adverse effects of theophylline include nausea, headache, insomnia, diarrhea, irritability, tremors, diuresis, vomiting, cardiac arrhymias, and seizures. [11] Also many medications interfere with this drug and can possibly increase theophylline levels. Other medications can interfere and lower theophylline levels.

Besides the cost and inconvenience of immunotherapy, safety is a concern. Between 1985 and 1989, there were seventeen deaths reported in the United States. This is about one fatality in every 2.8 million injections. Most of the fatalities occurred during the build-up phase of the therapy. This is because of a reaction to the allergenic extract with IgE. Thanks to recombinant technology, the possibility exists of modifying the major allergens so that they have reduced reactivity with IgE [12] . Recombinant technology is when you splice up DNA from one organism and recombine it with another organism.

Strategies

Students will utilize an interactive notebook which is a notebook that will help them to remember scientific concepts. The notebook uses both right and left brain hemispheres to help them sort, categorize and remember and creatively interact with new knowledge they obtain. The more students process information the more they will retain the information. There are many creative and unique ways students will interact with the information they obtain in the classroom, whether it's using graphic organizers, reflective writing, or other creative avenues for processing information. The use of the interactive notebook helps to promote differentiated instruction because it addresses the analytical learner through the right-brain input side and it appeals to the visual learner through the left-brain output creative side. Students will engage in the practice of Cornell notes for the input side whereby questions and notes are generated and summarize at the end of the lesson. For each question the student writes, he/she will identify the level of the question, according to Costa's system of classification. Since it is hands-on, the students' tactile/kinesthetic side gets displayed, with various activities that involve movement, as well.

Students will create a chart to access prior knowledge of what they know about asthma and what they **want** to know about asthma by filling in a KWL chart. KWL stands for Know, What, and Learn. Students will fill in what they learn about asthma as they work through the curriculum unit.

Students will use cause-and-effect links between certain activities and how it relates to asthma attacks. A *cause* is something that makes something else happen. Out of two events, it is the event that happens first. To determine the cause, ask the question "Why did it happen?"An *effect* is what happens as a result of the cause. Of two related events, it's the one that happens second or last. To determine the effect, ask the question "What happened?"

Students will brain storm "Big Ideas" about how they can improve the air in our school and what measures they can make to ensure the air quality at home meets the criteria. They will share their big ideas in a Socratic dialogue within the classroom and create a recommended checklist available for all to participate in looking for certain conditions that may be problematic to asthmatics. Not only will we examine my classroom, but other classrooms in the school, as well as the cafeteria, playground and school buses.

Activities (Adapted from U.S. Department of Health and Human Services)

Lesson One: What is Asthma?

Objectives

Students will be able to:

1. Define asthma as a condition that causes difficulty with breathing.
2. Explain that asthma can be controlled to allow children to be active and healthy.
3. Describe asthma as a condition that affects the airways in the lungs.
4. Explain that asthma cannot be caught like a cold or infection.
5. Describe the airways in the lungs as the part of the respiratory system affected by asthma.
6. Describe four signs and symptoms of an asthma episode such as coughing, wheezing, and shortness of breath, and chest tightness or chest pain.
7. List four things that can make asthma worse such as exercise, cigarette or other tobacco smoke, pollens, animals, colds, flu, and cold air.

Teacher Preparation

- Make copies of the pre/post test
- Obtain overhead equipment
- Make overhead *Respiratory System and Asthma*
- Make copies of *What Makes Asthma Worse cards*
- Make copies of *Classroom Scene: Find The Things That Make Asthma Worse*
- Read *Resources for Teachers*
- Obtain one unwrapped straw per student
- Write vocabulary words and definitions on the board before the lesson
- Vocabulary Words:

Asthma: A condition that affects the airways in the lungs causing difficulty with breathing. Asthma cannot be caught like a cold. Some people develop the symptoms of asthma when they are very young, and others do not have the signs and symptoms of asthma for many years. People can control their asthma and live active, healthy lives.

Allergies: A condition resulting in symptoms such as sneezing, itchy eyes, and stuffy nose. People with allergies react to pollens, animals, and things in dust that don't cause a reaction in most people.

Disease: A condition or illness with a specific set of physical signs and symptoms.

Episode: Any event or series of events.

Symptoms or Signs: Physical changes or feelings that show a disease or condition exist.

Asthma Episode: An event or series of asthma symptoms which may include coughing, wheezing, shortness of breath, and difficulty breathing.

Respiratory System: The parts of the body involved with breathing which includes the nose, throat, airways, and the lungs.

Classroom Activity: Administer and collect Pre-test. If instructional time is limited, you may want to omit the pre/post test. Use the *Check for Understanding* questions in the lesson to determine if the objectives have been met. Depending on your students' reading ability, you may want to administer the test orally.

Focus the Learner

Classroom Activity: Have students hold their breath for a little while.

"What happens if you hold your breath?" or "What happens if we do not get air into our bodies?" *Responses may include:* "*We need air so that our bodies can work*" *or* "*Without air we would die.*"

"When we finish this lesson, you'll be able to describe asthma. You will also be able to identify the parts of the respiratory system (or body, if you have not yet introduced body systems) affected by asthma."

Instruction

Classroom Activity: Pass out one unwrapped straw to each student.

"Let's see how it might feel to have difficulty breathing. Close your lips around the straw. Slowly and quietly breathe in and out through the straw. Put your thumbs up if you think it is fairly easy to breathe this way. Put your thumbs down if you think it's difficult. Most of you students should find it easy."

"Most of the time we can breathe in and out easily because our airways are open. Now close your mouth around the straw. With your finger, pinch the straw mostly closed in the middle. Try breathing in and out again. Put your thumbs up if it's easier or about the same as before. Put your thumbs down if it's harder. Most of you students should find it more difficult."

"When you pinch the straw, it makes it harder to breathe. How would it work to breathe through a straw if it were filled with a thick liquid like a milkshake?" Responses include: "*The thick liquid would make it very difficult to get air through the straw.*"

Classroom Activity: Display the transparency *Respiratory System and Asthma*.

Review the parts of the respiratory system pointing out the nose, throat, and the airways in the lungs. Have students label parts on the left side of the diagram. Review the right side of the diagram, which illustrates the airways during an asthma episode. Note the difference in the swelling of the lining of the airways during an asthma episode.

"How do the airways in the lungs look different on the right side of the diagram?" *Responses should include that the airways are not as big and this makes it hard to get air in or out of the airway.*

"In an asthma episode—some people call it an attack—the lining of the airways in the lungs get thicker and swollen. The airways get squeezed by the muscles around the airway. This makes the airways narrower, just like the straw when you squeezed it. The airways in the lungs also get filled with thick liquid called mucus. These changes make it difficult to breathe. The more the airways are pinched by the muscles, swollen and filled with mucus, the more difficult it is to breathe. It is something like the feeling you get when you have been running very, very hard. You have a hard time breathing in and out and feel like you cannot catch your breath."

"The straw is like the airways in our lungs. Most of the time, children with asthma can breathe easily because their airways are open. They can run and play and go to school just like other children. But sometimes, the airways in their lungs get squeezed like we did with the straw. The inside of the airways swell and get filled with a thick liquid called mucus. The child with asthma has difficulty moving the air in and out of the lungs. This is called an asthma attack or episode."

Check for Understanding

"What part of the respiratory system (or body) is affected during an asthma episode?" *Response should be: the airways in the lungs.*

"In what way is the respiratory system affected?" *Responses may include: the airways get swollen and filled with mucus, and squeezed. The narrow airways make it hard to breathe in and out.*

Closure

"We've learned what asthma is and that an asthma episode makes breathing more difficult. We also have learned what parts of the respiratory system are affected by asthma."

Focus the Learner

"What might a child having an asthma episode looks like or sounds like?" *Responses may include: "They sound like they are coughing" or "They look like they cannot catch their breath.*"

"In the next part of the lesson, you'll learn the signs and symptoms of asthma and what can bring on an asthma episode."

Instruction

"The physical changes and feelings that show that someone has a disease or condition are called signs and symptoms. For example, how can you tell if you're getting a cold?" *Responses may include coughing, sneezing, or runny nose.*

"We call these the signs and symptoms of a cold. They tell us that we have a cold. Most diseases and conditions have signs and symptoms. There are also signs and symptoms for asthma. The signs and symptoms happen when the person is having an asthma episode. What is one sign or symptom of asthma?" *Responses may include coughing, being short of breath, wheezing or noisy breathing, tightness or pain in the chest, gasping, and trouble talking or walking because they have trouble breathing.*

"The main symptoms of asthma are coughing, wheezing, and shortness of breath and tightness in the chest. They do not happen all at once. Some people may have only one sign such as coughing."

"Some symptoms may not be seen by others, but the person with the asthma episode would feel them. An example is chest tightness which might feel like having a heavy weight on the chest."

"Children with asthma do not always have difficulty breathing. Some children have very mild asthma. They are only bothered every now and then, sometimes only once a week or only a few times a year. Other children have very serious asthma. They can be bothered a lot or even most of the time unless they take medicine. A few children with asthma are bothered by their asthma much of the time even when they take their medicine. But *most* children with asthma can play and go to school just like children without asthma if they, their family, and a doctor work together and take care of their asthma."

"How do you think people get asthma?" *Possible responses might include: you have a bad gene, you catch it from someone, and your lungs are hurt somehow.*

"Scientists don't know exactly how people get asthma. They do know that most people with asthma were born with the chance to get it at some time in their life. Some people develop the signs and symptoms of asthma when they are very young; others do not develop symptoms until they are older. Asthma is not something that is passed from one person to another. You cannot catch it like a cold or infection. People with asthma have sensitive airways. Their airways can be very sensitive to ordinary things in the air. Have you ever walked into a room being painted? Do you remember the strong smell? Have you ever been near someone smoking? How did that feel?" *Responses include: made me cough, hurt my eyes, made my chest hurt.*

"People with asthma may get these feelings such as coughing and wheezing more easily than people who don't have asthma. Also, the airways in their lungs are more sensitive to some things that usually don't bother people without asthma. When they are around these things, their asthma gets worse and their airways get even more sensitive. Their airways get pinched and clogged. They have a hard time breathing in and out. Their asthma gets worse and their airways get even more sensitive. There are lots of different things that can make asthma worse."

Classroom Activity: If time allows, break into small groups at this point. Instructions to the group: "Many of you probably know someone with asthma. Think about the things that make that person have trouble with his/her asthma. In each work group, choose a recorder and brainstorm a list of things which can make asthma worse." Use the *What Makes Asthma Worse* cards to check the brainstorm lists.

Alternatively, continue the lesson as a teacher presentation. Use the *What Makes Asthma Worse* cards to illustrate the presentation.

"The ordinary things that bother most people with asthma include: dust from pillows, beds, couches, carpets; other things that bother people with asthma are cigarette smoke; allergies to furry or feathered animals such as cats, dogs, hamsters, or birds; allergies to tree and grass pollen; allergies to cockroaches; colds or flu; running or playing hard; cold air; changes in the weather; strong smells; chemical fumes; and laughing or crying hard."

Background Note: Anyone, even if they do not have asthma, may experience a very temporary shortness of breath after heavy exercise. Point out to students that this shortness of breath is different from the shortness of breath in an asthma episode. Even after heavy exercise a child without asthma recovers easily and has no other symptoms. Usually, the child with asthma will need treatment to recover from symptoms. Be sure that students understand that just because people have difficulty breathing during exercise or experience coughing does not necessarily mean that they are having an asthma episode.

Episodes can sometimes be brought on by the physical effects of strong emotions such as laughing, crying or strong emotional distress. However, it is important to know that asthma is not caused by emotional factors such as a troubled parent-child relationship. Some people think asthma is "all in one's head." This is wrong. It is a disease in the airways.

Additional Activity: Have a magazine picture hunt for things that make asthma worse. Students can work individually or in teams to identify and share pictures. Another additional activity is the Classroom Scene: Find the Things That Make Asthma Worse page. Pass the page out, have the students complete the page and then discuss it.

Closure

Classroom Activity: Divide students into small groups. Have each group brainstorm a list of things that make asthma worse. From the total group, develop a list that students can use to check at home for things that can make asthma worse. Have each student suggest "solutions" for problems they find at home.

"Today we learned: asthma is a condition that some people are born with which affects the airways in the lungs. During an asthma episode, the airways can be pinched and clogged, making it harder for a person to breathe. They have signs and symptoms such as coughing, wheezing, and tightness of the chest. We also learned that dust, cigarette smoke, exercise, cold air, colds, and allergies can bring on an asthma episode. Tomorrow you will learn what someone with asthma can do to stay healthy and how you can be helpful to someone with asthma."

Additional Language Arts Activity: Use the vocabulary words as spelling words. Have students use them in a sentence and write a story about a person with asthma using the lead phrase, "My best friend just found out he/she has asthma..."

Lesson Two: How Can I Help?

Objectives

Students will be able to:

1. State that asthma can be controlled when someone with asthma avoids the things that can make his/her asthma worse.
2. Describe children with asthma as active, healthy people who can run, play, and go to school.
3. Identify the things classmates can do to help a child who has asthma such as not tease, include the child with asthma in activities, and remind the child to take his/her medicine, stay calm in case of an emergency, get help if needed.
4. State that children who think they or a friend might have asthma can seek help from the people they live with, the school nurse, a doctor, or teacher.

Teacher Preparation

- Make copies of the Post-Test if not done for Lesson One
- Prepare *What Makes Asthma Worse* cards if not done for Lesson One
- Make copies of the *Scenarios*
- Make copies of the *Crossword Puzzle*
- Write vocabulary words from Lesson One on the board

- Write the following questions on the board: "What part of the respiratory system is affected by asthma?" "Describe in your own words what happens to the airways." "Name one thing that can make asthma worse."

Focus the Learner

Classroom Activity: Guide children, through either small group or whole class discussion, to discover the special plans and actions that they take to deal with the hot sun. This will set the stage for learning about the plans and actions needed to protect a child from an asthma episode.

"Think about going on an all day trip to a park where there will be swimming and games outside. The weather report says it is going to be very sunny and hot. What special plan or actions will you and your friends take so that you can have a fun, safe trip?" *Responses may include: food, swim suit, equipment for the games, sunscreen, hats, a shirt to cover up, and extra water.*

"We have to make special plans and take extra things to avoid getting thirsty or sunburned."

"Today you will learn what special plans and actions children with asthma can do to avoid or to control asthma episodes so they can be as active as children who do not have asthma. You'll also learn how we can help someone who has asthma."

Instruction

Classroom Activity: Review Lesson One. Elicit responses to the following questions and put correct response on the board and review. Use the appropriate *Respiratory System and Asthma* transparency and *What Makes Asthma Worse* cards to reinforce the correct answers.

"Yesterday, we talked about asthma. Turn to your partner and take turns answering the three questions on the board:

"What part of the respiratory system is affected by asthma?" *Response: the airways in the lungs.*

"Describe in your own words what happens to the airways." R*esponse: the airways get pinched and clogged making it hard to breathe.*

"Name one thing that can make asthma worse." *Responses may include: cigarette smoke, dust from pillows, exercise, furry and feathered pets.*

"Remember how we made special plans for the trip to the park to keep from getting too thirsty or getting a sunburn? That way we could play all day. Well, someone with asthma can make a plan to keep healthy. They can do things to avoid asthma episodes and keep themselves from getting worse if they start an episode. Those way children with asthma can run, play, and go to school just like anybody else."

Classroom Activity: Write on the chalkboard the things a child can do to prevent or control asthma episodes:

a. Avoid things that make asthma worse.
b. Take medicine.
c. Use a Peak Flow Meter.

An alternative, more interactive lesson is to group children in threes. Each child in the group reads and then

teaches the others in their group about one of the topics discussed below.

"Let's talk about each one of the things that a child can do to control their asthma."

a. Avoid things that make asthma worse.
b. Take medicine.
c. Use a peak flow meter.

Additional Activity: If there is a child in the class with asthma, s/he may volunteer to talk about his/her asthma and show his/her medicine and peak flow meter. The school nurse, a volunteer from a hospital, or a parent can be invited to come and give a demonstration of the peak flow meter comparing the readings before and after exercise for the whole class or on a few students. The person could also demonstrate asthma medicines.

Check for Understanding

"Can you name one thing people with asthma can do to control their asthma?" *Avoid things that make asthma worse, take medicine, and use a peak flow meter.*

"How can medicine be used for asthma?" *Response: some medicine is used to prevent an asthma episode. Other medicine is used to stop or reduce an episode that already has started.*

Instruction

"People with asthma feel fine most of the time. They don't want to be treated differently. When they do have an asthma episode, it is important to be kind and helpful."

Classroom Activity: If you have already instructed students in problem solving, use your model/format. In the scenario, the problem can be "solved" from Joe's point of view or from that of the rest of the class. Have the students "solve" it from the class's point of view first. If time permits, you can go through the steps as if you were Joe.

Scenario:

"Joe doesn't want to take his asthma medicine before his PE class or recess because other kids tease him about it. They say mean things. One kid called him a druggie. Some kids even hide his medicine from him. Joe feels hurt, angry, and embarrassed. During the PE class, many of the kids don't want Joe to be on their team because he often ends up having an asthma episode."

Problem Solving Steps	Teacher Key for Scenario
1. Define the problem	Kids are mean to Joe
2. Identify the alternatives	Keep teasing and being mean *or* Be kind by asking Joe to join teams, not teasing him, and reminding him to take his medicine.
3. Identify the consequences	Being mean could get students into trouble with the teacher; could make them feel bad; make Joe angry with them and/or cause Joe harm. Being helpful would make Joe feel better; students would not get into trouble; they could feel good about their actions.
4. Make a decision and act	Being helpful and kind to Joe would result in the most positive consequences.
5. Evaluate the decision; modify as needed	

Divide the class into groups of 4-5 students. Distribute one scenario (use the *Scenarios* sheet) to each group. Ask each group to identify a recorder, a reporter, a timekeeper, and one or two people to keep the group on the task. Have them discuss the questions and record their answers. Debrief the small group responses with the entire class. Summarize helpful and kind things students can do for someone with asthma. This may include: no teasing, no pressure to do things or stay around things that make the asthma worse, letting them take their medicine without making a big deal about it, reminding them to take their medicine before exercise when applicable, and helping during an asthma episode by getting adult help.

Select the scenarios that are most appropriate for your students. You can develop additional scenarios or encourage students to work on a problem that actually happened in your class or school. Working through the scenarios is an excellent way to reinforce a social climate which supports a child with asthma or other conditions. During your discussion, help students recognize that behavior like hiding a medicine or making someone with asthma be around something that can make his/her asthma worse can be very dangerous. It can make the student sick and perhaps lead to a very serious asthma episode.

Additional Language Arts Activity: Have students write to the child in their scenario who has asthma, giving the child suggestions of how she/he could respond to their classmates.

Additional Dramatic/Performing Arts Activity: Have students practice and perform scenarios as skits for the class. If time allows, you can make this section more active by having students write responses to the following questions on cards and show to the rest of the class.

Classroom Activity:

Question:

"We've identified ways we can be helpful to people with asthma. What signs or symptoms might make you think you might have asthma?" *Responses include coughing, trouble catching my breath after exercise, coughing when I am around chalk dust.*

Background Note: Most children will cough when exposed to chalk dust or may be short of breath after vigorous exercise. This does not mean that the child has asthma. A child without asthma will recover quickly, without medicines. A child with asthma may require medicine to recover.

Question:

"Now I would like you to think about what you would do if you thought you had asthma." *Responses should include telling parent(s)/guardian, school nurse and/or other trusted adult.*

Question:

"How can we help classmates with asthma?" *Responses should include: children with asthma in all activities, do not make fun of their medicine, help them stay away from the things that make their asthma worse. If needed, remind students that they can not catch asthma from each other.*

"The sooner people find out that they have asthma, the easier it will be to control and avoid serious asthma episodes and lead a life full of activities."

Closure

"Today you have learned ways that people can avoid and control asthma episodes by taking medicine, avoiding the things that make asthma worse, and using a peak flow meter. When people with asthma keep it under control, they can run, play, and go to school like everyone else. We also learned that we can help people with asthma by including them in activities, reminding them to take their medicine, and not teasing them."

Classroom Activity: Administer posttest. Review correct responses.

Additional Language Arts Activity: Use crossword puzzle.

http://www.nhlbi.nih.gov/health/prof/lung/asthma/school/46less1.htm

Endnotes

1. United States Environmental Protection Agency 2005)
2. Phil Lieberman 1999)
3. Wenda R. Trevathan 1999)
4. Raymond G. Slavin, M.D. and Robert E. Reisman, M.D. 2002)
5. Trevathan 1999)
6. Randolph M. Nesse, M.D. and George C. Williams, PH.D 1994)
7. Robert K. Bush 2001)
8. Bush 2001)
9. Kevin B. Weiss, A. Sonia Buist, Sean D. Sullivan 2000)
10. Michael Yeadon 2000)
11. Raymond G. Slavin, MD and Robert E. Reisman, MD 2002)
12. Raymond G. Slavin, M.D. and Robert E. Reisman, M.D. 2002)

New York: Marcel Dekkar, Inc., 2000.

The authors, medical doctors, address the topic of good medicine, not diagnosis, pathogenesis, or treatment of asthma, rather about the social barriers to applying what they know about asthma and its impact on society: the social and economic burden.

Yeadon, Michael, and Zuzana Diamant. *New and Exploratory Therapeutic Agents for Asthma*. New York: Marcel Dekkar, 2000.

The authors write about understanding asthma and the agents that are currently used to treat it and to take part in activities to discover, test, and develop further treatments. This volume provides an up-to-date overview of exploratory antiasthma medication.

Resources for Students

"Allergy Attack." *Weekly Reader.* Volume 88. May 7. 2010: 4-5

A weekly magazine that teachers can have delivered to their school and this one happens to have a cover story on allergies and how Americans are being affected and the causes of the rise of allergy and asthma sufferer.

Carter, Alden R. and Siri M.Carter. *I'm Tougher Than Asthma*. Albert Whitman & Co.

This book was written by a young girl and her mother dealing with life as an asthmatic.

Harrington, Geri. Jackie Joyner-Kersee: *Champion Athlete*. Chelsea House, 1994

This is a story of this extraordinary athlete and her struggle with asthma.

Martin, Ann M. *The Babysitter's Club: Welcome to the BSC, Abby*. Scholastic Inc., 1995

Abby, a new girl in town, has to be rushed to the hospital while she was baby sitting.

Ostrow, William and Vivian Ostrow. *All About Asthma*. Albert Whitman & Co. Morton Grove, 1989

This book was written by a young boy and his mother as they deal with his asthma.

Sander, Nancy. *I'm a Meter Reader*. Allen & Hansbury

This book teaches children how to use a peak flow meter.

Sander, Nancy. So *You Have Asthma*, Too. Allergy and Asthma Network Allen & Hansbury, 1988

This book teaches children about asthma in a delightful way.

Savage, Eileen Dolan. *Winning Over Asthma*. Pedipress, Inc., 2001

This is a story of a child living with asthma.