

Science Strand 5: Processes and Interactions of the Earth's Systems (Geosphere, Atmosphere, and Hydrosphere)

CLE: 5.2 Earth Systems interact with one another as they undergo change by common process.

Health Profession: Respiratory Therapist

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References:

Ozone action days. Retrieved January 28, 2008, Web site:

<http://www.ozoneactiondays.org/health.htm>

Martinez, Katherine (2007-2008). Lesson Tutor: How Do Your Lungs Work?.

Retrieved January 28, 2008, Web site: <http://www.lesontutor.com/km1.html>

AstraZeneca, (2008). Asthma Symptoms. Retrieved January 28, 2008, Web site:

<http://www.patienthealthinternational.com/article/505230.aspx>

Objectives:

At the completion of this presentation the high school student will be able to:

1. Explain how allergens in the atmosphere surrounding a person can trigger an allergic reaction.
2. Demonstrate how a person can be affected by allergens by setting up a test experiment.
3. Identify the importance of this information in relation to an individual with allergies and/or asthma.

Background Summary of Information as Related to Respiratory Therapists and CLE

The ozone layer, a layer of gas in the upper atmosphere, performs the vital role of protecting humans and other living things from the harmful ultraviolet (UV-B) rays of the sun. Ozone is the main ingredient of urban smog and can be hazardous to your health. Even at low levels, ozone can cause a number of respiratory effects, especially in sensitive individuals or with repeated exposure.

There are two basic types of Ozone Action Days: an Ozone Advisory and an Ozone Alert.

They are both related to the U.S. Environmental Protection Agency's Air Quality Index (AQI), which measures the health effects of breathing polluted air.

- An OZONE ADVISORY will be declared when the ozone forecast is code orange, indicating that prolonged outdoor exertion is unhealthy for sensitive groups such as children and people with asthma. Actions to reduce the formation of high ozone concentrations should be taken the day before a code orange day, as well as on code orange days.

- **An OZONE ALERT will be declared when the ozone forecast is code red, indicating that prolonged outdoor exertion is unhealthy for everyone. Actions to reduce the formation of high ozone concentrations should be taken the day before a code red day, as well as on code red days.**
- **Unusually sensitive people should check the daily AQI and ozone forecast regularly and consider limiting their outdoor activities when the AQI is code yellow.**

Scenario (Respiratory Therapist related to Science 2.A.a.)

Justin, a 15 year old sophomore with asthma, was in his gym class stretching out. The instructor informed the class that they would be doing the majority of their class outside on the track. It was a nice spring day and all the flowers and trees were in full bloom. Justin goes outside with the class to play flag football. While Justin is playing he begins to wheeze and have chest pain. He then becomes light-headed and dizzy. Justin is ushered indoors where he begins to feel worse. The school nurse is called and he is then rushed to the emergency room at the local hospital.

✓ What should the nurse do FIRST? Explain.

The nurse should make sure that Justin uses his inhaler first to help open his airways to improve his breathing. While Justin gets his dose of his asthma medicine, the nurse should make sure his parents are called about his condition and where they are taking him.

✓ After arriving at the hospital, what tests should be ran on Justin?

First, the nurses should put Justin on oxygen and check his O2 sats. They will check his vital signs including his blood pressure, temperature, and pulse. An IV could be inserted to help deliver medicines to help decrease the inflammation in his lungs. Blood gases, which is a blood test, are used to determine the gas exchange levels in the blood to help with lung function. An ECG, or heart monitor, could be done to determine any signs of illness or damage related to the asthma. A chest x-ray could also show any problems with the heart or lungs related to the asthma.

✓ What other information should be given to the emergency room doctor upon arrival?

Any medical history that the nurse knows or has of Justin should be given. Anything he is allergic to should be made known. Also, the nurse should inform the doctor what Justin was doing when the attack occurred.

✓ As a respiratory therapist, what drugs would you give Justin to help him start to breathe better?

The doctor would usually order breathing treatments to help open up the airways of the patient. Depending on the situation, the doctor can order inhalants to open airways. Also, the doctor can order antibiotics because the patient may have an infection that is causing the asthma attack. Sometimes medicine is given through

the IV or in pill form. These medicines help open the airways.

✓ **How would you explain to Justin what happens to his lungs when given the respiratory meds?**

The airways open up and allow for easier breathing. The wheezing comes to a minimum and the patient is able to calm down and breathe without complications.

Experiment 1

Experiment: How do your lungs work?

SUPPLIES:

One 1-liter or 1-quart clear plastic bottle

One large balloon

One small balloon

Two rubber bands

One straw

Modeling clay

DIRECTIONS:

- Cut off the bottom of the bottle. You can use a serrated knife, a utility knife, or scissors ... what ever sharp instrument you use, please use standard safety rules. Cut the neck off of the large balloon.
- Stretch this balloon over the bottom of the bottle.
- Put a rubber band around it to hold it in place.

- Insert the straw into the neck of the balloon.
- Tie the balloon to the straw using the other rubber band.
- Put the balloon end of the straw into the bottle so that the balloon is all the way into the bottle but does not touch the balloon over the bottom of the bottle.
- Secure the straw in the bottle by using the modeling clay.
- Make sure the clay completely covers the mouth of the bottle, but does not crimp the straw.
- Push on the rubber at the bottom of the bottle. What happens? Is this like breathing in or out?
- Pull the rubber down. Which way would you be breathing now?

What happens?

The stretched balloon across the bottom of the bottle acts like a diaphragm. This is the flat muscle at the bottom of the chest cavity. This muscle forces air in and out of your lungs. Your lungs do not inflate or deflate by themselves ... a muscle, your diaphragm, is pulling or pushing so that you can breathe.

Experiment 2

Experiment: How do your lungs feel when you're having an asthma attack?

SUPPLIES:

Regular Straws
Coffee Stirrers

DIRECTIONS:

- **First, take the regular straw and put your mouth around it.**
- **Next, suck in a deep breath with the straw still in your mouth.**
- **Then take the coffee stirrer and do the same thing that you just did with the regular straw, a long inhalation breath.**

How do you feel when you breathe through the regular straw? How do you feel when you breathe through the coffee stirrer?

When you lose your breath because of an asthma attack, it is because the airways have become narrow. This is what happens:

- **The lining of the airways becomes swollen because of inflammation.**
- **The production of mucus (phlegm) increases and may block the airways.**
- **The muscles in the walls of the airways tighten.**

This CLE, Earth Systems interact with one another as they undergo change by common process, was taught to help a student understand the processes that the earth can have on an individual with a respiratory illness and how a respiratory therapist can help the individual.

SUPPLIES NEEDED:

One 1-liter or 1-quart clear plastic bottle
One large balloon
One small balloon
Two rubber bands
One straw
Modeling clay Regular Straws
Coffee Stirrers

The following is a sample program of what an individual needs to do to become a CRT (Certified Respiratory Therapist):

Baccalaureate of Science Degree Registry Level: The B.S. Therapist program is four years long and has a total of 124 credits. The graduate of the B.S. degree program will possess all of the skills of the A.S. degree graduate. In addition, the B.S. graduate will have a more thorough knowledge of overall patient care and will develop, through use of clinical electives, an area of specialized clinical expertise. The graduate of the B.S. degree program is eligible to take the NBRC certification and advanced registry (R.R.T.) examinations.

Fall		Spring	
Math requirement	3	Human Communication	3
English Composition	3	Writing about Literature	3
General Chemistry I	4	General Chemistry II	4
Elective	3	Medical Terminology	1
	—	Information Literacy	2
	13		—
			13

Summer		Fall	
Basic Science for Respiratory Care (<i>10 weeks</i>)	3	Anatomy & Physiology I	4
Biology I	4	Pulmonary Disease	3
	—	Bronchopulmonary Hygiene	3
	7	Oxygen Therapy & CPR	3
		Clinical Practice I	1
			—
			14

Spring		Summer	
Anatomy & Physiology II	4	Elective	3
Pulmonary Function Testing	2	Patient Evaluation (<i>10 weeks</i>)	2
Mechanical Ventilation	4	Clinical Practice IV (<i>10 weeks</i>)	1
Pediatric Respiratory Care	2		—
Clinical Practice II	2		6
	14		

Fall		Spring	
Physical Education	1	Microbiology	4
General Physics I	4	American Civilization	3
Humanities	3	Social Science	3
International Studies	3	Cardiac Physiology	2
Pulmonary Physiology	3	Clinical Practice VI	1
Clinical Practice V	1	Physical Education	1
	15		—
			14

Summer	
Clinical Practice VIII (5 weeks)	3
	3

Fall	Spring
Elective	International Studies
American Civilization	Elective
Social Science	Humanities
Respiratory Care Seminar	Independent Study for
Clinical Practice IX	Respiratory Care
Elective	Clinical Practice X
	Elective
15	14

For More Information

Qualified applicants may contact [Mark Simmons](#), MEd., R.R.T., R.P.F.T., Program Director, Respiratory Care Program, York Hospital at (717) 851-2464 or [Jim Heindel](#), B.S., R.R.T., Clinical Coordinator, Respiratory Care Program, York Hospital at (717) 851-2944 or jheindel@wellspan.org .

Admission Office

York College of Pennsylvania
 Country Club Road
 York, PA 17405
 (717) 846-7788

Also Kansas University has a program available. To check this program and its requirements, go to:

<http://www.catalogs.ku.edu/undergraduate/majors/RespiratoryCare.pdf>